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# Salvage and Repair of Railroad Equipment

## Salvage of Material Formerly Sold as Scrap—An Air Hammer of Novel Construction A Portable Lathe—Handling Car Wheels

By S. ASHTON HAND
Associate Editor, *American Machinist*

RAILROADS in their present fight to make ends meet are practising economies not heretofore thought of. That old material formerly sold as scrap is now being salvaged and again put into serviceable use is evidenced by what may be seen in the railroad repair shops in almost every locality.

On the Atlantic Coast Line Railway, the tin roofs on freight cars, when damaged either by rust or accident, are stripped from the cars and sent to the shops, where they are first straightened. Then the damaged parts are cut from the sheets and new pieces inserted and fastened by lock seaming.

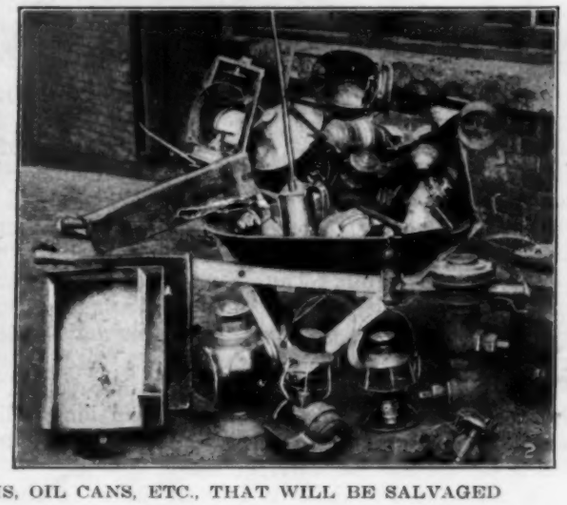

FIG. 1—A PILE OF DAMAGED CAR ROOFS. FIG. 2—LANTERNS, OIL CANS, ETC., THAT WILL BE SALVAGED

Some of the damaged car roofs on the Atlantic Coast Line are shown in Fig. 1 piled up at the Waycross, Ga., shops, where they have been shipped from all parts of the system. Here they will be reconditioned, again to do duty. The average cost of repairing these roofs is $6.40 each and as a new roof costs from $50 to $60, the saving is quite considerable.

A lot of damaged lanterns, car lamps, rear-end signal lamps, switch lamps, oil cans, etc., are shown in Fig. 2, and will all be put in serviceable condition at an average cost of about 45 cents each.

Round rods from worn out or broken ventilating doors of freight cars, from brake rigging and various other parts of rolling stock anatomy were salvaged at these shops in March, 1922, to the amount of 51,547 pounds.

The dining-car stove in Fig. 3 is undergoing thorough repairs, including a new lining of asbestos and the insertion of some new sheets. Formerly this stove would have been scrapped.

Waste taken from the journal boxes of passenger cars is brought to the press shown in Fig. 4 and the oil pressed out of it. The waste is packed in the receptacle at *A*, to which a piston is fitted. Pressure on the piston, supplied by air in the cylinder *B* (which by the way is an old air-brake cylinder) is sufficient to squeeze as much oil out of the waste as can be done by such a method. The waste is then taken from the press and put in a tumbling barrel made of wire mesh, contained in the tank *A*, Fig. 5, where it is immersed in water kept at the boiling point by the introduction of steam. Here the tumbling barrel is revolved, sloshing the waste in the water for 10 or 15 minutes to remove the balance of the oil, after which it is removed and put in the centrifugal separator *B* and the water taken from it. The reclaimed waste and oil are used for packing the journals of freight cars.

It may be wondered if the salvage of materials referred to actually pays, but when consideration is given to the fact that the majority of the work is done in

FIG. 3—A DINING CAR STOVE UNDERGOING REPAIRS

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spare time by help that must be paid, whether employed full time or not, it will be conceded that considerable saving has been attained. The air hammer for straightening rods shown in Fig. 6 is made from an 8 x 12-in. air-brake cylinder having the usual non-pressure head and internal spring. A square piston rod has been fitted to it to prevent the die attached to the piston rod from turning, this arrangement being much simpler and cheaper than making guides for the die to travel in. A series of $\frac{3}{8}$-in. holes drilled around the center of the cylinder at *A* allows air to escape when the piston has passed them on the downward stroke. When striking and compressing the spring, the piston is shot upward until the air sends it down again. Thus a very rapid reciprocating motion is secured without any reversing valve, and the greater the air pressure the longer and harder the stroke.

FIG. 4—PRESSING OIL OUT OF JOURNAL-BOX WASTE

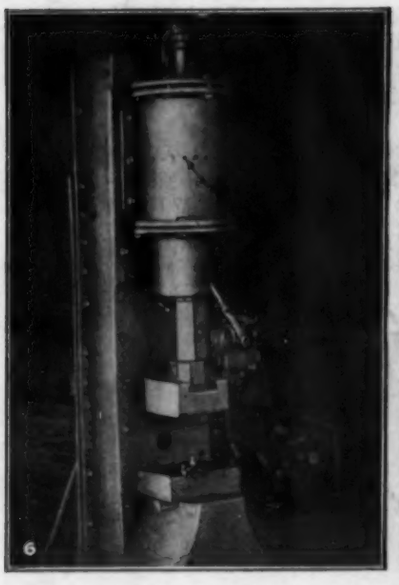
Staybolts in locomotive fire boxes have small holes known as tell-tale holes drilled in them longitudinally, so that should a staybolt break, the break will announce itself by the leak of water or steam.

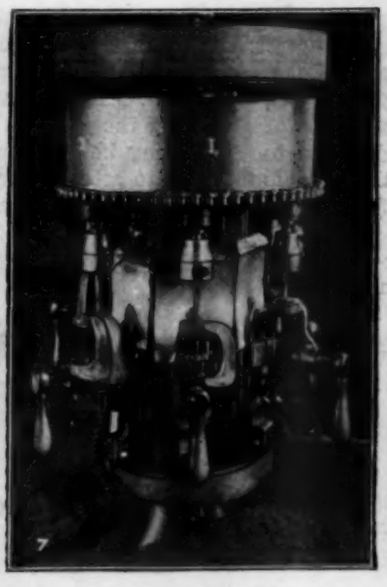
A machine for drilling tell-tale holes is shown in

FIG. 5—WASHING AND DRYING JOURNAL-BOX WASTE

Fig. 7, in which stations and fixtures are provided for six bolts around a central column. The bolts are held in V-blocks as at *A* and *B*, Fig. 8, and the drills are guided by bushings as at *C*. The fixtures are mounted on vertical slides, each having a roller bearing on the cam *D* below. In operation, all stations revolve around the central column and are pushed upward by the stationary cam *D* as they revolve, bringing the end of the bolt against the drill. It will be understood that the depth of the hole drilled is controlled by the height of the rise on the cam. When the roller attached to a slide reaches the low part of the cam at *E*, drilling of the bolt in that station is completed, and it can be taken out and replaced by another. It will be seen that the cam has a rise and fall at *G* which allows the slide to fall and then rise again before the drilling has been completed. There are several such places in the cam, and their purpose is to allow the slides to drop down at stated intervals so as to bring the bolts below the drill and clear the holes from chips.

In delivering car wheels after they are bored, they are lowered by the crane attached to the boring mill so that one edge strikes the top of the iron tripod shown in Fig. 9. Further lowering tilts the wheel so



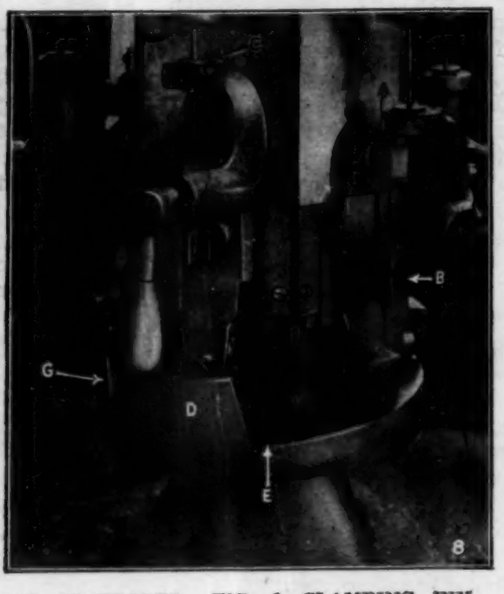




FIG. 6—A HOME-MADE AIR HAMMER. FIG. 7—MACHINE FOR DRILLING STAYBOLTS. FIG. 8—CLAMPING FIXTURES AND CAM OF STAYBOLT DRILLING MACHINE

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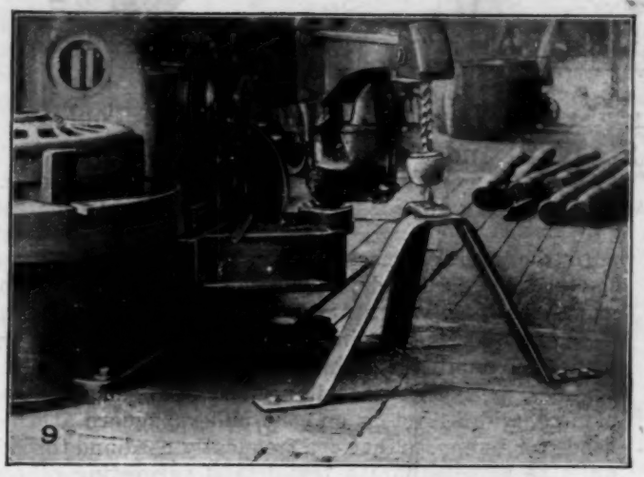
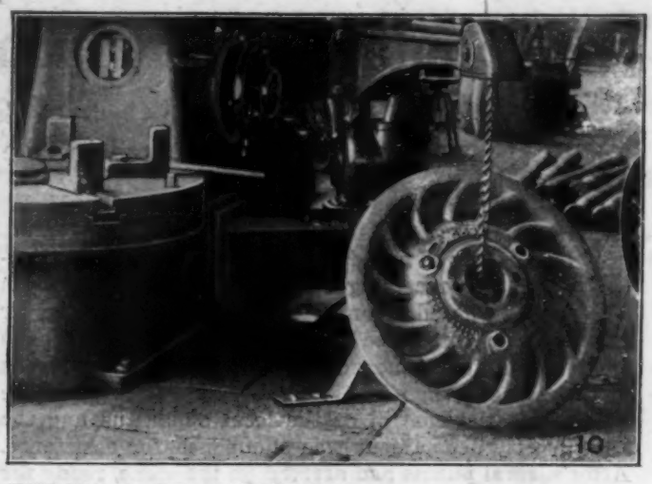




FIGS. 9 AND 10—HANDLING CAR WHEELS AT THE BORING MILL

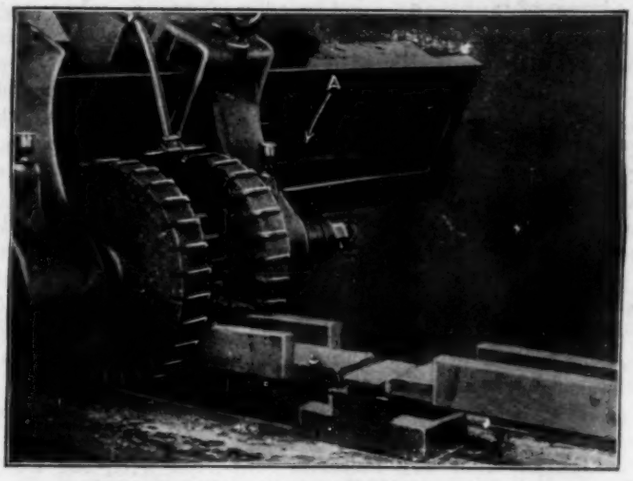



FIG. 11—MILLING SHOES AND WEDGES

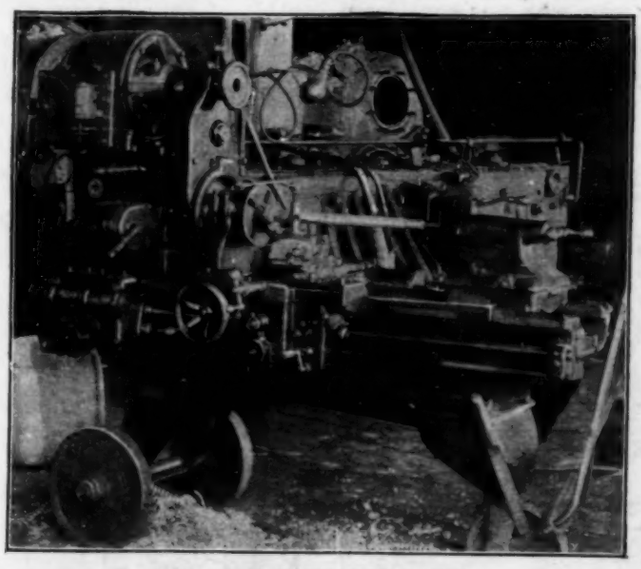


FIG. 12—A PORTABLE LATHE

that when the flange touches the floor, the wheel is an almost vertical position as in Fig. 10, and can be readily rolled away. Wheels to be bored are rolled up to the tripod and rested against it. From that position it is an easy matter to attach the crane chain and hoist them up and deliver them to the boring mill table.

Shoes and wedges are set up in a string on an Ingersoll planer-type milling machine, as shown in Fig. 11, and the three inside and two of the outside surfaces finished by a gang of cutters at one setting. This method leaves the bearing surface only to be finished in another operation.

The result of having to use "McAdoo mechanics" during the war is shown in the badly bent feed screw in the cross rail at *A*. The damage was done by allowing the head to come against an obstruction while being traversed by power.

It is getting to be general practice to have one or more portable lathes in the erecting shop and to place them directly beside the engine being worked on. Fig. 12 shows a motor-driven LeBlond lathe mounted on wheels so that it can be easily transported to any part of the shop. Such lathes are a great convenience since, among other lathe jobs, there are many taper bolts to be turned and fitted to place in overhauling an engine, and to carry them to and from the shop to the engine several times between cuts to try the fit is a tedious process. Also much other work can be more conveniently done if the lathe is close to the work.

## Balanced Equipment

BY ROBERT GRIMSHAW

Just as a chain is no stronger than its weakest link, few plants have any greater capacity or efficiency (please note the difference between "capacity" and "efficiency," because there is a wide gulf fixed between them) than is permitted by the least productive machine or the one with the least output.

In a properly equipped manufacturing plant, each production center should be able to take care of all the work from that preceding it and keep the next one exactly and profitably busy. We find this balanced condition infrequently and particularly seldom in small plants, or rather in those where each process or operation is performed on but one or two machines. In consequence, the idle time account of some machines or production centers is excessive.

In a tour embracing about forty manufacturing plants in this country, I found but one in which there was perfect balance. In this case there were large groups of machines for each operation or process. It is easy to see that, if six machines of one kind cannot take care of the output of five or the kind preceding, another may be added much more efficiently and economically than where one of a sort cannot handle the product of the one back of it.

# Standardizing Machine Shop Equipment

## Advantages Which Justify the Cost—A Successful Method of Improving Old Tools—Tapers Reduced to One Standard and Two Sizes

By H. L. WHEELER

IT IS pleasing to note that the subject of standardization is now receiving some favorable consideration which is based upon a desire to establish better conditions in commerce and industry. As an example of the need for standardization, I recall a disastrous fire some years ago in a neighboring town. The fire got beyond the control of the local apparatus and the near-by city department was summoned for assistance. After several pumps had arrived on the scene, ready for business with a full head of steam, it was discovered that the hose connections would "not go." The fire could not be extinguished, and a quarter of a million dollars in property went up in smoke. Since then I have given much thought to the subject of standardization. Figuratively, this fire is an example of what goes on in business and in industry every day in the year through the lack of standardized conditions and methods, and I would not hazard a guess as to the probable amount of money lost in this way.

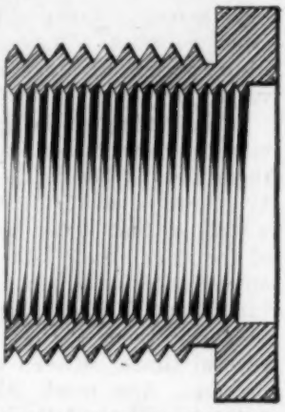


FIG. 1—CHUCK ADAPTER FOR SMALL LATHE

In machine shops long established and still using equipment built in the last forty years, for there are many such, numerous details of machines and equipment may be standardized with profit to the shop. This sometimes involves a change of method in doing certain jobs, rebuilding machines or making over certain details of them to make them more efficient or up to date. It has been fully realized that a great disparity prevails in the details of machines and equipment, which necessitates surplus effort and expense, and occasionally results in a general demoralization.

It is with the object in view of bringing about greatly improved conditions and of making the practices of the industry more economical and universal, that standardized conditions should prevail in the shop. Standardizing equipment is quite distinct from activities along similar lines in other fields, but the fundamental principles are the same. So many advantages are to be derived from standardization, that the cost of making the necessary changes is of secondary consideration. Perhaps a limit should be set on the amount of money to be spent for such work. From the writer's experience, an amount equal to 25 per cent of the original cost of the machine is not too high a figure, providing of course that the results to be obtained are sufficiently promising. Good judgment and plain horse sense, however, should be the guide in this undertaking.

It is sometimes necessary to make radical changes and to eliminate a list of items which have long been looked upon as indispensible. The first step in this work should be to make a careful study and survey of the equipment and conditions, and to collect data.

In the average machine shop are found machines, small tools and sundry equipment of many different makes, none of which agree in important details that have to do with the saving of time and money. Tapered holes in milling machines, lathes and drill-press spindles, bolt slots in milling machines, shapers and planers, width of steps on cone pulleys, square and hex heads for wrenches that are frequently used and threads on lathe spindles, are a few details suggesting others.

Several different tapers in a shop are a constant source of annoyance and needless expense when one standard taper would serve all practical purposes. This standard would eliminate many bent arbors, broken drills and centers, ruined drill chucks and burred and cut spindle holes, would save much time now wasted, and would appreciably reduce the small tool expense. Here in one item alone, standardization would save ten times its cost every year.

It may not be possible to induce the machine builders to adopt a standard taper and other standard details, but the individual shop can have a standard of its own. The work of making the necessary changes can in most cases be done right in the shop. Some ideas and a method of standardizing equipment successfully employed by the writer, may be of use to others.

After a survey of the machines, tools and other equipment was made, a special shop order was issued, to which all labor and material connected with the work were charged. The next step was the selection of a man who was considered capable of carrying out the work to its completion. The whole situation was gone over with the man selected, who was an excellent mechanic, and the object in view was explained to him. He was allowed a free hand and was instructed to use his own head. One machine at a time was standardized and repaired where needed, so that the work did not interfere with the regular production.

As most of the lathes in this shop were of an old model with solid spindles, some hollow spindles were designed by the writer to take their places. As the chucks had seen many years of service, they were not considered worth repairing, and so were replaced by new chucks. The threaded ends of the old spindles were

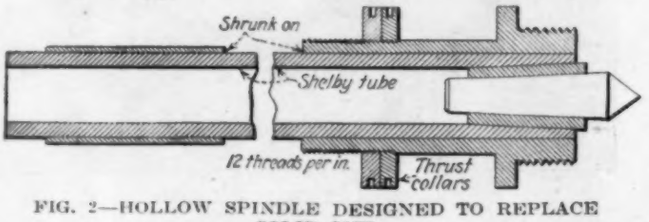



FIG. 2—HOLLOW SPINDLE DESIGNED TO REPLACE SOLID ONE

of small diameter, and would not support the heavier chucks in use today. In designing the new spindles it was possible to use the same thread on the spindle noses for lathes of the same size, and so to make all chucks and faceplates interchangeable. As the chucks were seldom all in use at one time, by this arrangement, three chucks were amply sufficient to serve six 18-in.

lathes, and one chuck served both the 20- and the 24-in. lathes. Two sizes of chucks were purchased for the 18-in. lathes and by using an adapter, shown in Fig. 1, the smaller chuck was made available for a 12-in. lathe.

For one lathe, an 18-in. Putnam, a little more modern than the others, a special spindle was designed, as shown in Fig. 2, and was fitted with a set of new Hendey spring chucks. This feature became a great favorite with the men for getting out small orders of special screws, studs and other round parts made from bar stock. Under the old order, this class of work had to be cut off, centered and turned between centers on account of the solid spindles.

In making the hollow spindles, Shelby steel tubing was used. This material can be purchased in a variety of sizes and will give excellent results. It also eliminates the expensive operation of deep hole drilling, something that every shop is not equipped to do. For the taper hole, the Morse standard was adopted. Two sizes, Nos. 2 and 4 were all that were needed for our work. In some shops, three or more sizes may be required. Two tapered gages and two tapered finishing reamers of corresponding sizes were purchased for this work, which should be carefully done to the correct standard gage. Otherwise, serious trouble will develop in the interchange of tools. Centers were made all of one size, except for one 8-in. lathe which required a special center.

### Odd Screw and Wrench Sizes Eliminated

The work of changing the spindles of drill presses and milling machines is practically the same as that described for lathes. There were three drill presses in this shop, and each had a different taper. This condition required the use of different sized adapters, and chuck shanks.

If a man desired to use a drill chuck in a lathe or in some other machine for which the shank was not fitted, he would have to drive out one shank and put in another. Often a new man, not on to the "ropes," would endeavor to use a chuck or the wrong adapter in some machine for which it was not intended. Occasionally, he would get away with the job by packing the adapter with paper or by some other slip-shod method. With this practice, for years such tools were always in a bad state of repair and many were on the sick list a good part of the time. Manifestly, the ideal condition is to have a single standard taper in two or three sizes.

Square and hex heads on setscrews, bolts, nuts, toolpost screws and vise screws that are frequently used in making adjustments, setting up and operating a machine, may be standardized and many odd sizes may be eliminated. In the case of milling machine vise handles, for instance, a common size can be used so that the handles will be interchangeable on vises of different makes.

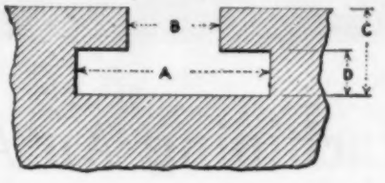
Standardization is also an advantage in toolpost binding screws and in many other places. Frequently a vise handle or toolpost wrench is mislaid and cannot be found at the exact moment it is needed; or perhaps some one has borrowed it and will not bring it back until he is finished with it. But if he can turn right around and use the handle or wrench on the next machine, how much more time he will save than if he wastes 10 or 15 minutes in hunting for a wrench and finally is forced to use a monkey wrench.

A feature about binding screws, of which many mechanics are ignorant, is the chance of straining the screw by using too large a wrench. This is what often occurs to milling-machine vise screws and toolpost binding screws, when a heavy monkey wrench is used in place of the right wrench that cannot be found.

### Reducing the Variety of Bolt Slot Sizes

Bolt slots in machines should also be developed to a minimum number of sizes, so as to reduce the variety of sizes required to serve all machines, and to thereby reduce the time lost in looking for bolts in setting up a machine. A standard may be arrived at after comparing the sizes of the slots in the several machines to be changed. In a group of several planers, milling machines or shapers of approximately the same size a single bolt slot size may be possible.

Milling out the slots to the desired size is a simple operation. An example of this procedure is illustrated in Fig. 3, which gives the details of a slot for four different machines. The data for standardizing this group of slots are shown in the accompanying table. It will be apparent from this arrangement, that one sized bolt will serve the four machines, whereas before, four sizes were required and three out of every five bolts were always unserviceable. This method may be followed for any number of machines in one group.




| | 1 | 2 | 3 | 4 | Std. |
|---|---|---|---|---|---|
| A | 1 1/16 | 1 1/8 | 1 1/8 | 1 1/8 | 1 1/8 |
| B | 13/16 | 11/16 | 7/8 | 11/16 | 7/8 |
| C | 1 | 1 1/16 | 1 1/32 | 1 3/16 | 1 3/16 |
| D | 7/16 | 9/16 | 17/32 | 1/2 | ..... |

FIG. 3—DETAILS AND SIZES OF BOLT SLOTS FOR FOUR DIFFERENT MACHINES

Many machine-shop managers are skeptical as to the value of making the changes which have been outlined. The changes are small details in themselves and are seldom considered worth changing, although the average shop is required to support many items of expense which might easily be reduced by one-half through the simple process of standardization. The popular excuses for maintaining these conditions are the lack of time and the expense of making the necessary changes.

No matter how busy your shop may be, if you haven't got the time, take it and standardize every possible detail of machinery, tools and equipment. In the purchase of new equipment, it is well to consider the details that conform to the standard adopted, or the details that can be changed with the least expense.

The field of standardization offers many opportunities for saving both time and money in every machine shop, regardless of the size or the nature of the business. Does it pay? Yes, absolutely, it pays in dollars and cents right from the start and is a permanent improvement. It is a divided-paying business proposition, and deserves just as much attention from machine shop proprietors as standardization receives in other lines.

Perhaps in no other kind of business is there a greater lack of standardized conditions than in the average machine shop. Conditions, traditions and environment stand in the way of many improvements and standardization, particularly in small details.

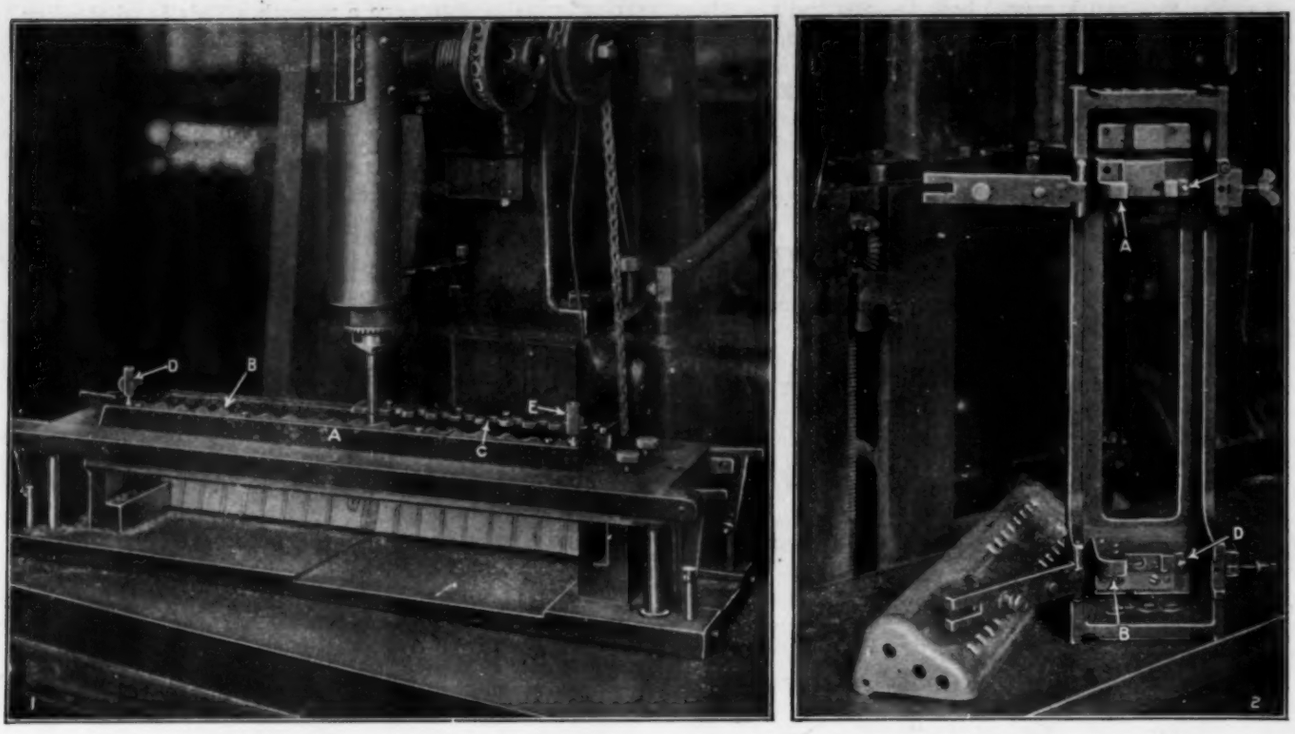



FIG. 1—MILLING WINDOWS IN COVER. FIG. 2—DRILLING THE END HOLES

# Machining An Aluminum Carriage Cover

## Die-Castings Used for Uniformity Rather Than for Elimination of Machine Work—Profiling, Drilling and Milling in Special Fixtures

BY FRED. H. COLVIN
Editor, *American Machinist*

IN ORDER to secure aluminum castings that are uniform and true to shape, the Monroe Calculating Machine Company, Orange, N. J., is utilizing die-castings as a starting point for its machining work. While on small work die-castings are used to eliminate machine work, this company has not found it advisable to do this in pieces as large as are required in the parts for its calculating machines, such as cases and covers. As castings, however, they work out very nicely, as they fit into jigs and fixtures remarkably well and are uniformly solid.

The piece shown herewith is a cover for the moving carriage and contains many windows through which the numbers show in reading the results of the calculations. There are several sizes, the largest cover being about 21 in. long.

After testing for straightness the cover is placed in the fixture shown in Fig. 1, where the windows are milled under a single-spindle vertical drilling machine. The holes are cast with a very thin web through which the milling cutter forces its way as the spindle is moved down into the milling position. The cover *A* of the fixture carries two serrated plates *B* and *C*, which guide the milling cutter in cutting out the windows as the whole fixture is moved along the drilling machine table. The top plate is held by four latches at the ends and is easily removable to change pieces.

The end holes are first milled and the hardened plugs *D* and *E* put into place to insure against possible movement of the piece in the fixture. Then the fixture is simply moved from window to window, being guided by the plates *B* and *C*. The plate *B* extends the whole length of the cover, while *C* is but half as long. Each hole is tested by an oval plug gage to insure uniformity.

The cover then goes to a multiple-spindle drilling machine as in Fig. 2, for drilling the end holes which support the shafts carrying the numbered wheels. This

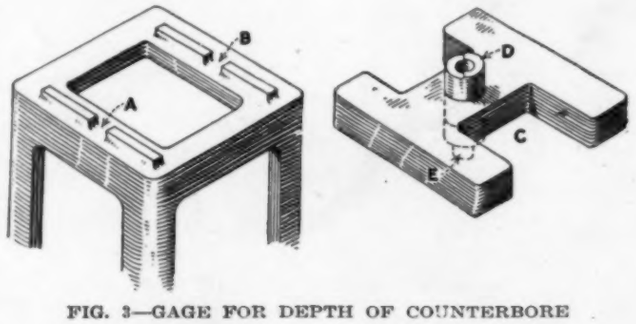
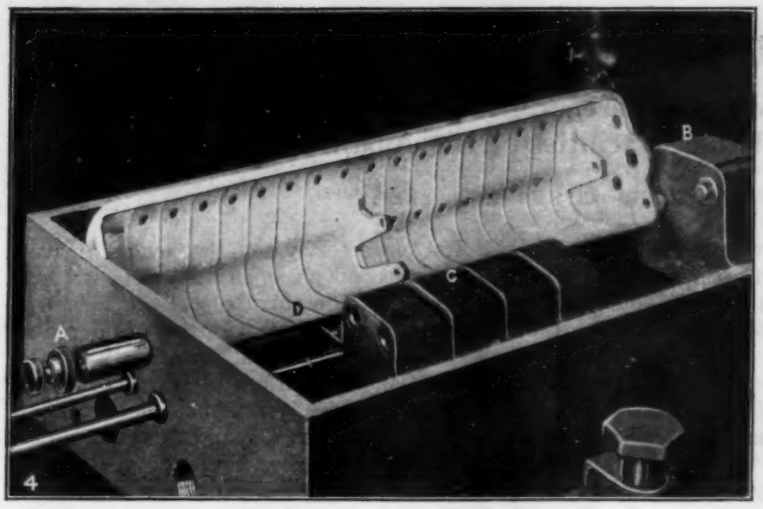



FIG. 3—GAGE FOR DEPTH OF COUNTERBORE

figure gives a good idea of the fixture and the way in which the cover is held. The curved blocks *A* and *B* fit up inside the cover and support it, while the edge rests on the pins *C* and *D*. The straps are held by the swinging bolts at the right, and each strap carries a clamping screw which bears on the high part of the cover holding it tightly against the curved blocks.



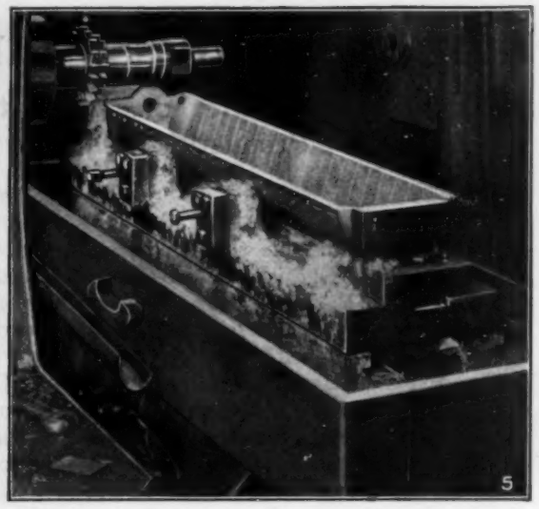




FIG. 4—DRILLING THE CENTRAL HOLE. FIG. 5—MILLING EDGE AND FACE OF COVER

Both ends of the fixture have raised feet which are surfaced both for drilling and for gaging the depth of the counterbore. This is shown in detail in Fig. 3, the raised feet being indicated at *A* and *B*. The gage shown at *C* rests on the feet and can be moved from hole to hole to see that they are all counterbored to the same depth. The flush pin gage at *D* tests the depth of counterbore, the lower portion of the plug at *E* being the gaging point that is brought to bear on the bottom of the hole.

The drilling of the holes in the central or supporting partition presented something of a problem, but it was solved by using a gun drilling lathe secured at a government sale. The fixture, shown in Fig. 4 accommodates three sizes of covers, the one shown being the shortest. The cover is positioned in the box-like fixture by pins which fit the end holes previously drilled. The pins are shown at *A* and *B*. Those at *B* are located in a block which can be moved inside the fixture itself, to accommodate the different lengths of covers.

The central block is fixed in position, but has three slots so positioned as to fit the different sizes of covers. This block is fitted with bushings which guide the drills *D* and insure accuracy in the alignment of the three holes which carry the wheel shafts. This operation requires considerable care on the part of the workman to be sure that no chips prevent the proper seating of the cover in the fixture, and to properly seat the guiding pins at each end of the cover. The results are very satisfactory, however, and the assembly goes along very smoothly when it is being done by a man who understands the work.

The final machining operation on the cover is milling the edge to insure proper seating when assembled on the machine. Here again the cover is located by the end holes, as shown in Fig. 5. It is carefully supported, both at the ends and at two other points, to avoid any springing of the casting under the milling cut, even though this is very light. The two cutters shown face both the edge and the side at one operation.

## Filing Technical Articles

By Jasper H. Carlstrom

Many of the articles in the *American Machinist* are very useful to refer to in my work, especially those on tool engineering. As it would be inconvenient for me to carry the entire copies of the magazine to my work, I find it necessary to cut out those articles not likely to be of benefit to me. I usually allow the copies to accumulate a couple of months, and, having read them through, proceed by means of a sharp safety razor blade to remove those pages I want to keep.

The pages having been piled in their numerical order, the headings of the articles are then copied down with their corresponding page numbers on a piece of paper. The articles are now placed in manila paper envelopes, ten by twelve inches in size, preferably those whose flaps are fastened by a cord. It may be necessary to trim off the bottoms of the pages. The volume and page numbers are then marked on the envelope, as, for example, Vol. 56, pages 413-844.

I now proceed to make up the index as articles are classified into five divisions: Tool Engineering, Auto Tools and Methods, General Machine Work, Dies, Die Work and Small Tools, Theoretical and Miscellaneous Articles. The index is made up on sheets of typewriter paper about 5½ x 8½ in. in size by typewriting at the top the classification of the articles, followed by the headings of the articles with their corresponding page numbers. These are copied from the list already made up and checked from it as copied.

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By this means any article may be quickly found by referring to the classified index for the volume and page numbers which, as already stated, are marked on the envelope in which the article is filed. The index sheets are placed in a smaller envelope and this is kept in the latest large envelope to be filled. The material is always readily available and can be easily located by referring to the index and then finding the proper envelope.

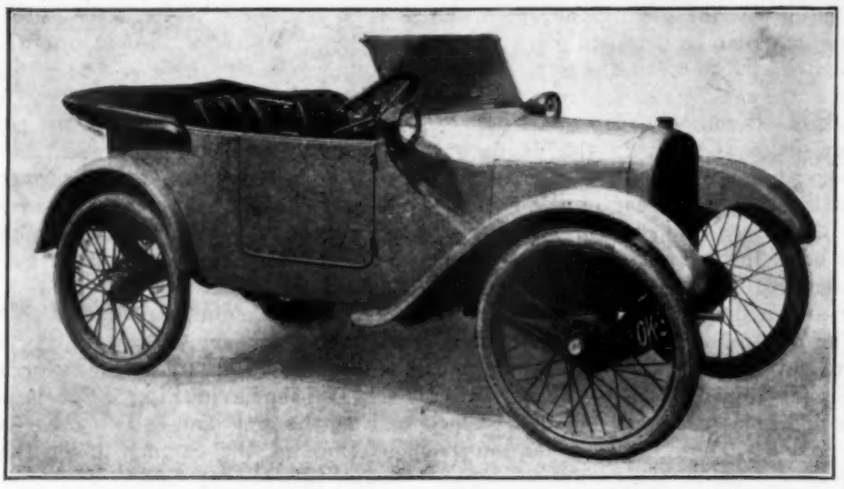
# Mass Production in British Motor Industries

## British Manufacturers Beginning to See Difference Between Mass and Standardized Production—Plans to Utilize Facilities of Big Austin Plant

By Henry Obermeyer and Arthur L. Greene

"Mass production on the American model was the dream of several English automobile manufacturers not very long ago. Each felt that if he could get on the job first he could collar the market. That was a dream from which we woke up with a bang."

Thus the sales manager of the Austin Motor Company, Ltd., whose factory sprawls over the acreage of a fair-sized town just outside of Birmingham, England, and which company was one of the big concerns to feel the rocks as the result of over zealous productivity immediately after the war, is about to place on the market a new light pleasure car in competition with the popular priced automobiles of American manufacture. The details of the car and plans for its manufacture have only just been announced.



THE POPULAR-PRICED RUNABOUT RECENTLY ANNOUNCED BY AUSTIN

The war embarrassed many countries with certain kinds of "riches" whose peacetime utility was comparable to a white elephant. Many of these have not been properly liquidated or even disposed of yet. This condition, of course, was especially true of machine factories most of which found themselves, after almost superhuman activity, possessed of a suddenly idle army of workers and a hugely distended plant.

In England the inflated plants were a standing temptation. English manufacturers had long envied their American compeers the ability to do big things in a big way, to turn out by hundreds what they themselves sweated to produce by tens. They had the idea that American success in that direction lay in big organizations, in factories which were cities in themselves. Here at the British hand was just such an organization, born of necessity and obviously fitted for just one thing—quantity.

So, for a time, did the English dream come true. For two years following the war the chimneys belched their smoke and the hum of a tremendous activity throbbed through all the shops. A stream of cars sped from the factory to the outflung posts which were the agents. For a few months the agents had all they could do. It really did seem as if English motor manufacturing had gone through its revolution. Then, even more suddenly than it began, the boom ended. There was talk of bankruptcy. One or two actually did go under. The rest gasped and struck for shore.

Austin Motors believe they know the reason for the fiasco. "In the first place," they say, "we overestimated the market. In the second place, in our haste we sent out faulty products. In the third place, the idea was silly and should never have been seriously considered at all. The domestic market for cars at that time was fair, but only fair. The Colonial market, the great prop and staff of all English industries, was almost non-existent. Given something like a normal demand in the colonies, particularly Australia and New Zealand, the dream might not have been beyond the range of possibility. But here again the project caused so many complaints among car users who felt they had been cheated with an inferior product that the very shadow of a worldwide market was blotted out from the beginning. As a result of the situation mass production in England has received a shock from which it is never likely to recover. British manufacturers have learned what is to them the amazing truth that quantity and size are not, after all, the essential features of American industry. Say "mass production" to an Englishman today and he will pretend not to know what you're talking about. At best he will correct you to the use of "standardized production," thus proving that he has grasped the fundamentals of the problem.

"After all, you know, mass production is the result, isn't it?" they said in Birmingham. "It's the means that are important, and in this case they consist of the principle of duplication, the single-purpose machine, the die stamp. Duplication means not merely accuracy, but speed, interchangeability, and, most of all, economy."

This fairly obvious aphorism was expressed with all the wonder of a discovery. It is important, however, as indicating the lines on which certain British manufacturers of motor cars propose to work. The Austin Motor Company, Ltd., consider that they are now operating on a system of standardized production and Austin automobiles and engines are turned out by single-purpose machines. The parts are assembled by being swung into place, where they fit without a trial.

While the Austin Motor Company, Ltd., has spanned the gulf between individual production and standardized production, it has not thus far been wholly successful in educating the market to the advantages of the new method. It has been found necessary to maintain an entire shop solely for the construction of models of

special design, which are, it is true, in decreasing demand, but are still a very potent factor in automobile manufacturing abroad.

Henry Ford has estimated that in America only five per cent of the automobile buying public normally exhibit any preference for special variations to suit special tastes in the construction of their cars. The English public is still far from achieving such an ideal of uniformity. Many an Englishman regards his automobile in much the same way as his home. He wants it to express something of his personality. In addition there is the deeply ingrained prejudice against any system which seems to rob the workman of the traditional pride and interest in his product. England is a land of apprentices. A handmade watch or a handmade bit of lace may be inferior to the machinemade article, but it is more likely to command the Englishman's respect.

Thus, educating the market to a more pronounced faith in standardized production is the goal which Austin Motors, among others, has set for itself. In the fulfillment of this aim the Austin company is among the leaders. From motives of pure self defense it must be a leader if for no other reason than its tremendous facilities which, otherwise, would be like so many cancers eating up the profits of the business without making a return.

### Mushroom Growth of the Austin Plant

For factories like the Austin plant the war was a modern Atlas which shifted the weight of armaments to the shoulders of the industrial Hercules without making provision for relief. The Austin Motor Company, Ltd., now occupies about fifty-three acres in the Longbridge section of Birmingham and is divided into three parts, known respectively as the South, West and North works. In 1914 only six of these acres, situated in a small corner of the South works, were used for manufacturing, in short, nearly a ninefold increase in only four years. The increase in personnel was proportionate.

During the early stages of the war, the Austin company was asked only to concentrate on transport and tank equipment, which required comparatively little alteration either of product or method. Armored cars, lorries, aeroplanes, aero engines and tractors were supplied in ever increasing quantities. But the original factory became inadequate for the growing demands of the Government. A call for guns and shells on a large scale developed. Not only were the old South works extended, but engineers hastily constructed a new factory on the west side for the specific production of 18-lb. shells, and still another plant to the north for the manufacture of 8-inch shells and 4.5 howitzer guns. This last, incidentally, is said to be one of the largest individual shops ever built. It is 900 feet long and was ready for work within six months after the first stone was laid.

### Market Lags Behind Plant Capacity

Such is the gigantic machine which Sir Herbert Austin, founder and managing director of the company, has to his hand today. Imagine the producer of anything you choose starting off modestly on a small scale to supply a profitable but strictly limited market with his commodity. Imagine his astonishment and eventual dismay at finding that his plant has grown mushroomlike over night (kept pace with by overhead expenses) without either his volition or desire. Consider his panic at discovering that his market had not only failed to grow in proportion to his plant, but had actually contracted. Consider especially, as we do here, his attempts to deal with the situation.

It has been shown how Sir Herbert and some of his competitors began by what seemed at least the most obvious method, that of engaging in large scale production in apparent imitation of American firms. That stage has now passed, perhaps forever, into a fitful memory. But the factories are still there. There are, therefore, two roads open to the British manufacturer of automobiles. He can attempt by enterprising salesmanship to increase the market where it exists, or he can seek a new one. Here again, he can look abroad, although it is not unlikely that American competition will drive him out. He can even create a new market at home. In the latter case he is just as much an innovator as Henry Ford, who foresaw a popular demand for his car, not merely for pleasure but for business purposes and proceeded to supply the demand when other manufacturers were still concentrating on racing cars.

### A New Light Car

We doubt if Sir Herbert Austin has any ambition to become the Henry Ford of the British Isles. Nevertheless, for the past two years he has been at work in his experimental shop on a new type of roadster which will, it is expected, combine the speed and durable qualities of more expensive cars with the cheapness and economy of operation of the motorcycle. Admittedly, this is a large order to fill. At any rate, the first three cars of the new type have left the factory and successfully passed all required tests. The great body of Austin agents, who were called in meeting for an announcement of the new car a few weeks ago, are said to be most enthusiastic and have shown their faith in the model by ordering up to capacity. The machines themselves will be in their hands in small quantities by fall and more widely, it is hoped, by the first of the new year.

Such a car, if at all successful, should have the advantage of a unique market in England which exists in America only as a reflection. For years, England with its splendid roads, its charming scenery, has been in a special sense a cycling nation. In America the bicycle was a fad which had its day and passed. In England the cycle is a necessity. Lately it has been superseded, in the case of those who can afford it, by the motorcycle. There may not actually be more motorcycles, especially sidecar combinations, on the roads than there are automobiles, but to the casual eye it would seem so.

### Tremendous Market Assured

Here without doubt is a tremendous market for the man who can reach it. Ford has not done so. With transportation and duty charges, his car is still beyond the financial capacity of the motorcyclist. Such attempts as have been made to wean the motorcyclist from handlebars to the steering wheel have been largely makeshift, consisting of three-wheeled affairs with motorcycle engines or tiny roadsters at a cost only less than that of more serviceable machines. Sir Herbert in most particulars has tried to design "a car what is a car." His sales manager expresses it most succinctly. "We want to convince the purchaser that he really owns an automobile while charging him the price he would spend for the original cost and upkeep on a motorcycle."

In addition to the cyclist group, the Austin Motor Company, Ltd., also hopes to attract those two other vitally important classes, the woman driver and the commercial traveler. For reasons which will be apparent further on, no attempt is to be made now at the manufacture of light trucks from this type of car.

The appearance of the Austin "Seven," as it is called to distinguish it from the "Twelve" and "Twenty," is apparent from the picture. It has a four-cylinder water-cooled engine with a bore and stroke of 2½ and 3 inches respectively, capable of 7.2 hp. as rated by the R. A. C. Ignition is by high tension magneto controlled from the steering wheel. The seating capacity is for two persons and luggage or for five persons including three small children. A road clearance of nine inches is allowed.

### Dimensions of Car

The dimensions of the car, over all, are 8 ft. 8 in. by 3 ft. 10 in., weighing 650 lbs. As a matter of actual road performance, the "Seven" has attained a speed of fifty-two miles per hour. Under perfect conditions it has achieved a consumption record of 78½ miles to the gallon, although fifty-five miles are said to result in normal operation. Complete running cost is estimated at 1¼d. per mile.

The new car, ready to ride, is to be put on the market at £225, or approximately £50 more than the best type of motorcycle combination. This is said to be only preliminary, however, a price settled on by the agents themselves, who agreed to take as many cars as the factory can turn out for many months. In time it is the expressed intention of the company to bring the price of the Austin "Seven" in more direct competition with that of the cycle combination, the manufacturers of which are themselves believed to be about to make substantial reductions.

Further operations of the Austin Motor Company, Ltd., will depend largely on the reception given to the new car. As requirements express themselves certain changes will undoubtedly be found necessary in the design. The wire wheels, for example, are approximately of motorcycle dimensions and, despite more than satisfactory tests, give the appearance of flimsiness. At any rate, they may be found to detract from the "carlike" appearance of the automobile and time may see the substitution of more substantial looking rims and hubs.

### Yearly Models Frowned Upon

The company is strongly opposed, however, to the principle of periodic changes in design, which have been customary abroad as well as in America to attract the crowds at the yearly Motor Exhibition. This custom, which is based rather on faddism than utility, is obviously disastrous to a perfect system of standardization, and will be ignored, so far as possible, in the construction of the Austin "Seven."

As indicated above, the Austin "Seven" is peculiarly a pleasure car. This ignores a principle, which is fairly well established in America, that the automobile, whatever it was in the past, is now at least and in the future is to be both a business necessity and a personal luxury. To the great disappointment of British manufacturers and the astonishment of American exporters, the English commercial classes, slower, perhaps, than Americans to adopt new ideas, have failed to appreciate the possibilities of the automobile in business. In England the motor is still a toy to a very large extent, and as such is quick to feel a temporary trade depression.

The Austin Motor Company, Ltd., has been given as an example of certain conditions in the British motor world because it has shown itself quickest in adaptation to the unfortunate circumstances brought about by the war, circumstances which may, however, in the end prove the reverse of unfortunate. Other automobile factories have the same problem to deal with and may be expected to apply similar methods of treatment. It is not too much to prophesy that Great Britain will be ready to make a serious fight when the markets of the world reopen.

## Temperature Recommendations for Thermit Welding

In order to compensate for the lower melting point of cast iron as compared with steel, the Metal and Thermit Corporation, New York, recommends that in preheating cast-iron sections, preparatory to thermit welding them, these sections be heated little more than necessary to show color, such as a dull red heat. If this advice is followed, we are told, a quieter pour will be obtained and the fusion will be just as perfect. This practice has now been tried successfully in numerous cases, the most important being a thermit weld on a large cast-iron press head which required 1,100 lb. of thermit. The weld was absolutely perfect, with good fusion to the extreme of the edge of the collar, although the cast-iron section was heated only to a dull red heat.

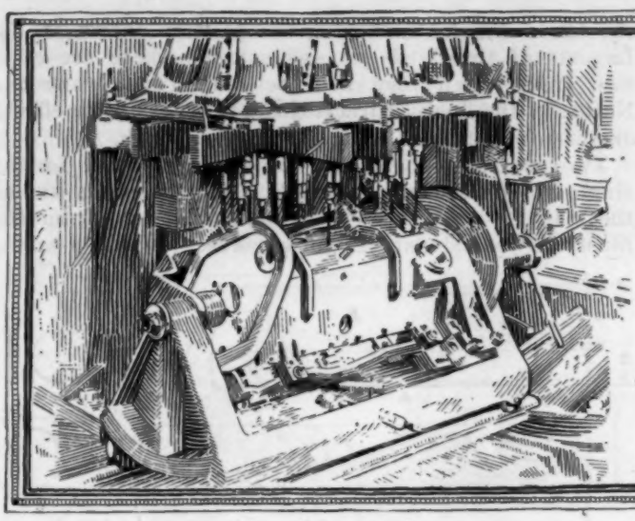
It is believed that this point is very important and that operators will find that it will overcome possible difficulties which they may be experiencing in cast-iron welding. One might suppose that, as the cast iron of the parts being welded is not quite so fully expanded at this lower temperature, there might be a slightly greater tendency for hairline cracks to appear in the thermit steel collar perpendicular to the line of break. In actual practice, however, this has not been found to be the case, probably because of the fact that the expansion curve is much greater up to a red heat than it is from the red heat to the white heat and that the sections are, therefore, practically fully expanded at this dull red heat. It is certainly also true that the thermit steel at first heats and expands the sections with which it comes in contact and that the slight difference in preheating is negligible.

## Bonus for Long Service

By A. L. De Vinne

Until an employee commences to get worthless he is a more valuable hand after years of service than when he came, even than after he got into his stride. He knows where things are, he can do some one thing automatically better than any new hand and he can do other things reasonably well from long association with the work and occasional assisting and substitution. He has proved himself likely to stick, and not apt to have a yearning for "fresh fields and pastures new."

This being so, it is well to pay an annual bonus—without any promise, expressed or implied, after the expiration of a given period; the percentage of the wages and the length of the period depending upon the scarcity of the kind of labor in question and the length of time required to learn that particular work.



# Tool Engineering

By
*Albert A. Dowd and Frank W. Curtis*
*President and Chief Engineer*
*Dowd Engineering Company, New York City*

## Details of Design of Blanking Dies Continued—Laying Out Work and Punch Positions Singie- and Double-Run Layouts—Double Blanking Dies

IN THE previous article we have discussed a number of general matters pertaining to the design of blanking dies. In these general statements we have endeavored to illustrate points of importance which apply not only to the blanking of the metal or cutting it into shape, but also to the progress of the work through the die and other matters which affect the design generally.

We shall now go into the matter in much greater detail and illustrate a number of points in the design of blanking dies in a graphic manner, bringing out principles which apply to the subject and treating the entire matter from its fundamentals so that the designer will thoroughly understand the principles on which the science of die design is based. It is not our intention to show a great variety of dies for different purposes and for different forms which are to be cut out of metal. Such matters could be presented in very extensive form if it appeared desirable; but there are so many applications of punches and dies to different kinds of work that it seems better to deal almost entirely with principles of design, making each point as clear as possible, and then illustrate the application of these principles by means of a comparatively small number of actual examples of dies themselves.

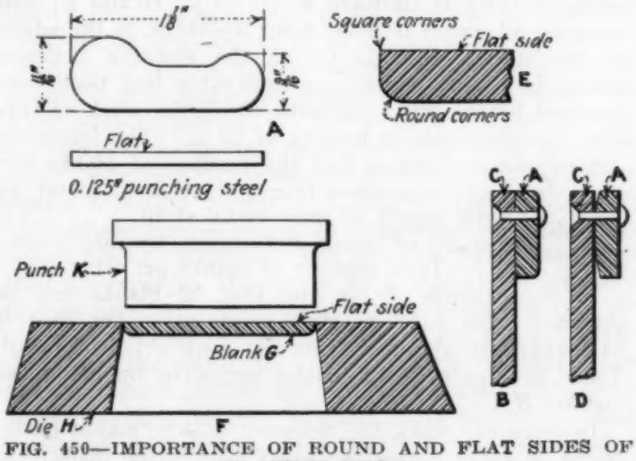



FIG. 450—IMPORTANCE OF ROUND AND FLAT SIDES OF BLANKED WORK

The first point to be considered when it becomes necessary to make up dies for a given piece of work, is the shape of the work which is to be blanked. When considering this matter it must be remembered that all stampings from blanking dies have a round and flat side. The flat side is that next to the punch, while the side which first passes through the die is slightly rounded on the corners. When parts are to be assembled with other pieces after blanking, it is necessary that the flat sides should be adjacent to each other. If the work is not symmetrical, the flat side should be specified on the part drawings. Therefore, in designing dies for a given piece of work and in making the most economical layout possible, this point should be considered first. Fig. 450 shows several of these points very clearly.

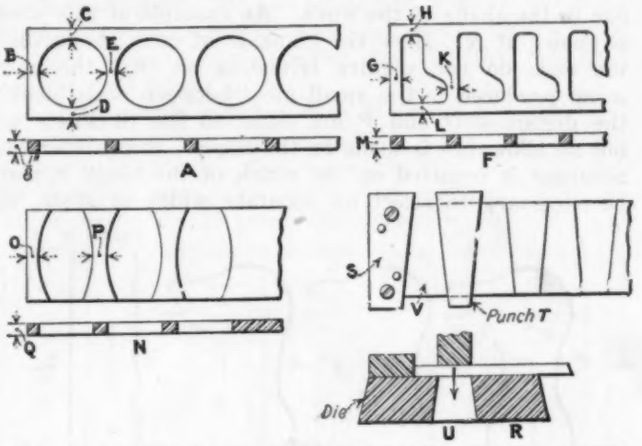



FIG. 451—POSITION OF PUNCH IN BLANKING OPERATIONS

The part shown at *A* is not symmetrical and it must be laid out so that it will be forced through the die in such a manner that the side which is adjacent to the piece of which it is to form a part will be flat and not round. Referring to the sectional view at *B*, the part *A* is shown assembled with *C* by means of rivets, and it can be noted that the two parts lie closely together. On the other hand, if the curved side of the work *A* were to be assembled as shown at *D*, the piece would not lie close to its fellow and an imperfect unit would be the result.

A sectional view with the conditions greatly exaggerated is shown at *E*, in order to illustrate the differ-

ence between the round and flat sides of a blank. The reason for this difference is clearly indicated in the sectiona view at *F*, in which the work *G* is forced through the die *H* by means of the punch *K*. The rounding of the corner is not noticeable on stock under $\frac{1}{32}$ in. thick and does not need to be considered; but when any work above this amount is blanked, particular attention must be paid to the matter.

In laying out the position of the punch in blanking dies, the part to be punched must be so located that the greatest possible number of blanks will be produced for each length of strip stock. In punching out a round piece such as that shown at *A* in Fig. 451 there is really only one way in which this layout can be made. One point of great importance in connection with the laying out of dies is the distance between the blanks. The space between the blanks and the amount of stock around the blank on the edges should usually be equal to the thickness of the stock being punched. For example, if the work at *A* were $\frac{1}{4}$ in. thick, the various dimensions at *B*, *C*, *D* and *E* should also be not less than this amount.

In the example at *F* the blank is somewhat more irregular, but the same rule applies here and the various distances at *G*, *H*, *K* and *L* should be uniform and of the same size as dimension *M*. There are occasional cases when it is not necessary to allow a distance equal to the thickness of the stock on the edge of the blank, due to the shape of the work. An example of this kind is shown at *N*. Here the blank is of such shape that the ends do not require trimming so that the only scrap produced is the small piece between each blank; the distances *O* and *P* are equal to the thickness *Q*, but no allowance is made on the edges. If considerable accuracy is required on the width of the blank it may be necessary to select an accurate width of stock, or

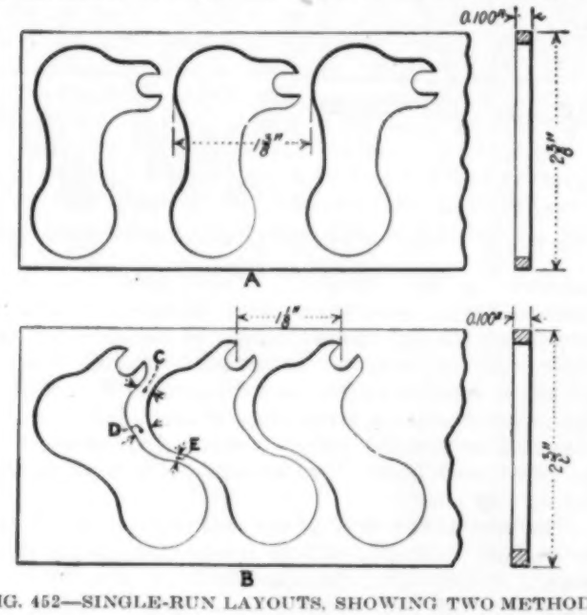



FIG. 452—SINGLE-RUN LAYOUTS, SHOWING TWO METHODS

to run the stock through a "shaver" set to produce the required width.

Another example is shown at R in which the blank is produced without leaving any scrap, and no allowance is made between blanks or on the edges. The work is forced up by the operator against a stop *S*, and the punch *T* is so positioned that on each stroke of the press two parts are produced. One of the blanks passes down through the die, as indicated at *U*, while the other remains on top in the position shown at *V*. Layouts of this kind are unusual, but there are certain times when they may be found an advantage. Naturally the final accuracy of the work has some effect on the selection.

Two methods of laying out a work blank for a single run are shown in Fig. 452. The stock from which the blank is to be made is 0.1 in. thick. In order to illustrate the advantages of a correct layout, a com-

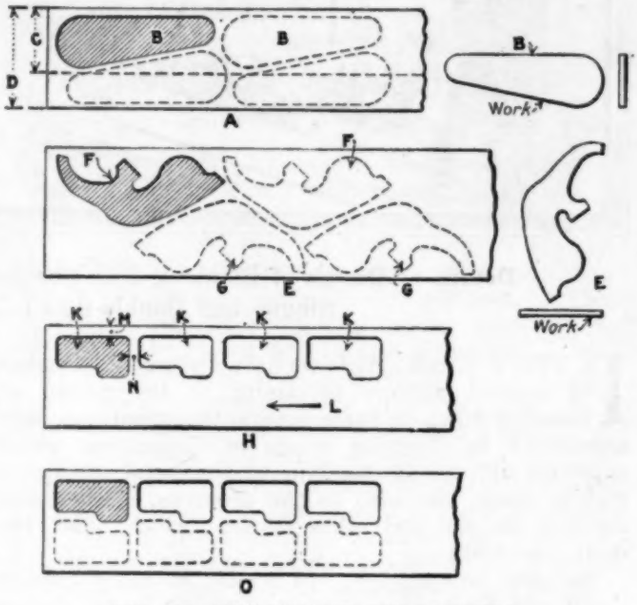



FIG. 453—DOUBLE-RUN DIE LAYOUTS

parison may be made between the two methods indicated. In the example *A* the blank is laid out straight and a distance equal to the thickness of the metal is allowed between blanks. A corresponding amount is also allowed on the edges. The width of the stock required in this method of laying out is $2\frac{3}{8}$ in., the amount of stock required for each blank is $1\frac{3}{8}$ in., and it will be noted that there is a considerable amount of scrap in this layout.

In the example shown at *B* the work has been turned around at a slight angle, so that the width of the scrapped stock is uniform at points *C*, *D* and *E*, and an equal allowance is made from the blank to the edges of the stock. In this layout the distance between blanks is $1\frac{1}{8}$ in., which is considerably less than that required by the other method. Stock for work of this kind usually comes in lengths of 72 in. The following method can be used to find the number of blanks per strip that can be punched from one sheet of metal, as follows:

$$\frac{\text{Total length of sheet-metal strip}}{\text{Length of blank} + \text{Distance between blanks}} = \text{Total number of blanks per strip.}$$

In the example *A* we find that 52 blanks can be obtained from a 72-in. strip, whereas in the case *B* 64 blanks are obtained from the same strip of metal. There is a gain of 12 blanks per strip by using the method *B*.

In irregular work the designer usually makes pasteboard or paper forms the exact size of the blank, and by adjusting them in various positions and tracing around them it is easy to find the most economical angle at which the punch can be set. This method is commonly used when laying out a die.

A double-run is the term used for a layout in which stock is run through the die twice. Several examples

of double-run die layouts are shown in Fig. 453. In order to illustrate the difference between a single and double run, let us refer to the example *A* in which the blank to be produced is shown by the dotted lines at *B*. If this work were to be made in a single-run die the width of stock might be as shown at *C*, while if a double run were to be made the total width of stock required would only be equal to dimension *D*. In using a die laid out in this manner the stock is blanked on

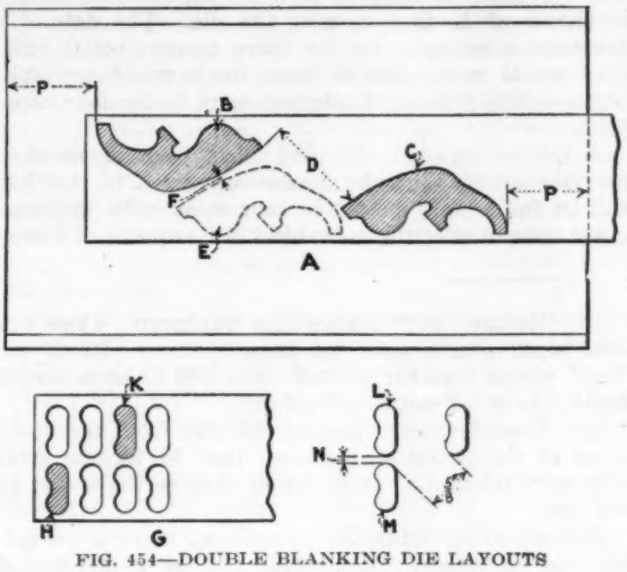



FIG. 454—DOUBLE BLANKING DIE LAYOUTS

the first run in the usual way, and then the strip is reversed and run through the die the second time.

The shape of the part determines whether or not a double run should be used. It must always be remembered that there is considerable time wasted in reversing a strip of stock and getting it ready to run it through the second time, so that a double-run die is not always as advantageous as it may appear at first thought. The amount of stock saved in the double-run layout shown at *A* is in that saved in the width of the stock. The blank can, of course, be arranged in a different way and a layout made so that the parts would be produced across the strip instead of lengthwise. This arrangement would take somewhat longer stock and there would be no gain in the final results obtained.

In the example shown at *E* the work is considerably more irregular in shape, but the same principle is applied and a double run made in order to produce the work more economically. The work is fed through the die twice, as in the first case, the blanks being produced at *F;* and then the stock is reversed and the other blanks produced as shown by dotted lines at *G*.

Another example, shown at *H*, illustrates a double-run layout for the blank *K*. The stock is fed in the direction indicated by the arrow at *L* and the blanks are formed successively, stock allowance being made at *M* and *N* according to the thickness of the metal. After the stock has been run through along one edge, the strip is turned and the opposite side blanked, as shown at *O*. In determining whether it is better to make a single- or double-run die the shape of the piece is a governing factor. If less waste is produced by a double run and a considerable saving effected, it is evident that this method is to be preferred.

Double blanking dies are often confused with double-run dies, although there is a distinct difference between them. A double blanking die stamps two pieces at one time, although the layout of the blanks may be the same as that used for a double-run die. A good example of this sort of a layout is shown in Fig. 454 in which the strip *A* is for the same part which was illustrated in Fig. 453. The width of the stock and the number of blanks per strip are exactly the same; but it is unnecessary in a double blanking die to turn the stock around, as the punches and dies are so arranged that the two blanks shown solid at *B* and *C* are cut at the same time at one stroke.

One of the most important points in the design of double blanking die is to make sure that a proper distance between punches is obtained. In the example shown the distance *D* is sufficient for a layout of this kind. If punches were located so as to produce the blanks shown at *B* and *E* at the same time, the distance between holes in the dies would be only the amount shown at *F*, which construction would probably cause distortion in hardening and short life to the die, even if no breakage occurred in hardening.

The size of the die itself should be great enough to permit a generous amount of stock all around the openings, as indicated at *P*. Another example, shown at *G*, brings out this point clearly. In a double-run die for this piece of work the punches should be located so as to produce blanks as at *H* and *K*, in order to allow a sufficient amount of stock to give a long-lived die. If punches were to be located as shown at *L* and *M*, the distance *N* would be too small and trouble would be likely to occur. By locating as shown the distance between holes is much greater and the dies will have a great deal longer life.

A general rule which applies to double blanking dies for stamping work up to $\frac{1}{4}$-in. thick is that the distance between the punches should never be less than $\frac{3}{8}$ in., and for heavier work this amount should be increased. These points are of great importance when laying out

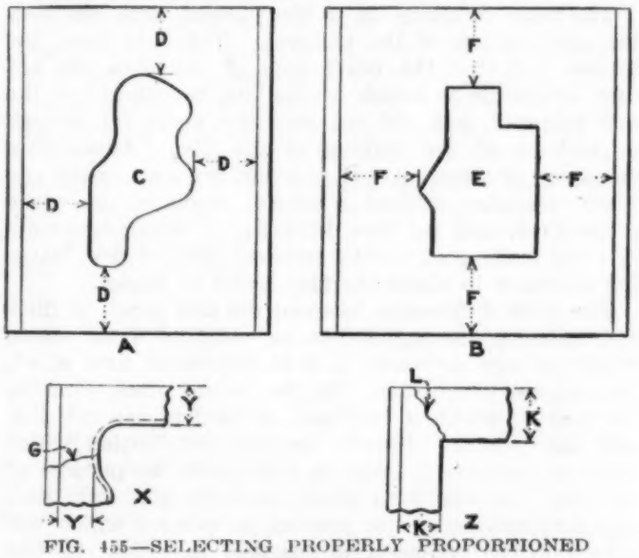



FIG. 455—SELECTING PROPERLY PROPORTIONED DIE-BLOCKS

dies, and the designer should keep them in mind.

In addition to double blanking dies, there are occasional cases when multiple blanking dies may be used. The principles on which these dies are designed are exactly the same as those employed in the design of double blanking dies, the only difference being that multiple dies make more parts at one time. It is sometimes found profitable to use something of this kind where high production is desired when blanking.

Mention of the standardization of die-blocks has been made in a previous article; but it is well to speak of the importance of selecting a die-block of generous size, so that it will have long life, and will not be subject to distortion or cracks in hardening on account of an insufficient amount of material being allowed. Fig. 455 graphically illustrates a number of these points.

In the example shown at *A* the die is made to blank the form *C*, which has round corners throughout. The distance between the die opening and the edges of the die as shown by dimensions *D* should be not less than 1¼ in. for stock up to ⅝-in. thick. By making provision of this kind in selecting a standard die-block no trouble will be experienced from distortion in hardening or from breakage caused by thin walls. As the stock increases in thickness the distances around the opening should be increased.

In the example *B* the shape of the blank *E* is to be made, and as this blank has sharp corners the dimensions *F* should be, if anything, somewhat greater than those shown at *A*. The danger of cracks in hardening is greater when sharp corners are required. In the example shown at *X* the distances *Y* are too small, and weakness may develop so that a crack may be formed in hardening, as shown at *G*. A somewhat similar condition is illustrated at *Z*, where the distances *K* are also too small so that a crack develops in the corner as shown at *L*, thus ruining the die. The defect is doubtless accentuated by the sharp corner; yet if sufficient metal were allowed here, there would probably be no difficulty if the hardening were to be done carefully.

A list of standard die-blocks has been given in a previous article, and the dimensions given in this list will be found very useful in connection with the data given here in selecting a die-block for any size of blank.

## Moving Pictures in the Machine Tool Industry

By D. S. Hazen

The use of moving pictures as both educational and advertising factors has great possibilities in the machine-tool industry. The first factor, classified as service instruction, includes those films which are specifically built to aid the users and operators of machine tools.

The second factor, classified as educational propaganda or advertising, consists of those films which are built for the specific purpose of interesting potential buyers. In this illustrative way, the features of the processes or products are so presented that the buyer may recognize their good qualities.

The main difficulty up to the present time has been the distribution of the pictures. This has been due to the fact that the purchasers of the films did not first determine to which of the two classifications the film belonged, and did not lay their plans far enough in advance of the making of the film. Advertising managers or company owners would not contemplate any other campaign without a careful study of the whole proposition, and yet they have rushed whole-heartedly into the making of moving pictures without first learning where or to whom the films could be shown.

The wide differences between the two types of films and between the results to be obtained from them, point out how necessary it is to determine, first of all, the purpose of the film. In the second place, examine the field in which it has been decided to use the film, and find out the chances for the distribution which must be obtained in order to accomplish the purpose of the film. In the third place, carefully pick out those specific features of the product or process which will appeal to the prospects in the field in which the film will be used.

After these features have been worked, out, the making of the film becomes comparatively simple. Some general rules for film-editing are as follows:

(1) Make the film as short as possible without omitting any of the necessary processes which should be shown.

(2) Arrange the various processes in a logical order so that the reader of the film may easily follow the idea to be conveyed. In other words, get good continuity.

(3) Reduce "still" scenes to a minimum. (You can send plain photographs for these scenes.) Blend the "live" scenes together so that there will be no apparent break. In other words, get action.

(4) Consider every part of the film from the viewpoint of the potential audience; that is, include what will be of interest to them rather than to the maker of the film.

Outside of an actual demonstration, there is no better way of showing a machine tool or a mechanical process to a man than by a moving picture. Sometimes the "movie" will show the workings of a machine even better, as in the same of the so-called "slow-motion" pictures. Advertising films, which are educational in a way, should show those features of the product which make it a "worth-while buy" for the customer. In the case of machine tools, they should not only illustrate the uses, and the results of the uses of the machine, but also should describe the mechanical reasons why such good results are obtained.

### Distribution of Films

It is the writer's opinion that the best distribution scheme of a machine-tool "movie" is the direct circulation from the offices of the machine-tool builder. The more or less technical character of the film as well as the special character of the field in which the film will be welcomed, makes the circulation problem rather a strange one to the general distributing agencies unacquainted with the machine-tool industry.

A centralized bureau is needed as a clearing house to collect all the types of films and to offer specific fields for them. This is presumably the idea back of the co-operation plan of the National Association of Manufacturers and of the government. The latter is undertaking the distribution of well-made films through a special department in the Bureau of Foreign and Domestic Commerce.

The more important work of the Bureau will be the exploitation of American products in the foreign markets through an educational campaign which uses moving pictures as the medium. Several foreign countries are now using the "movies" to show their products in the foreign fields. However, the well-known superiority of the American-made film gives our film advertising a much easier start. By the use of moving pictures, the difficulty of explaining technical processes or machines in a foreign tongue is also overcome.

# Blanking and Piercing Tools for Watch Parts

## Escapement Is Important Feature of Movement—Accurate Workmanship Essential
## Pillar-Type of Sub-Press Used—All Working Parts Ground and Lapped

BY I. BERNARD BLACK

IN THE design and construction of dies for watch parts a great deal of time, care and forethought is demanded because of the extreme accuracy required of the product of the tools; and of no part of the watch mechanism is this more true or the work more exacting than in making those tools that are to produce the several pieces comprising what is known as the "escapement." This escapement is, perhaps, the most vital part of the watch movement, and in its making and adjustment none but the services of an expert can be employed if the time-keeping qualities of the watch are to be assured.

In this article the writer will endeavor to describe the dies that produce the pallet, a very important part of the escapement, and in order to make clear to the reader the necessity for extreme accuracy in their design and construction, will briefly explain the functions of this part.

The escapement is that part of a watch movement by means of which the rotative movement of the wheels is transformed into the vibratory, or oscillatory, motion of the balance. The members included in the escapement are the escape wheel, the pallet, the fork, the

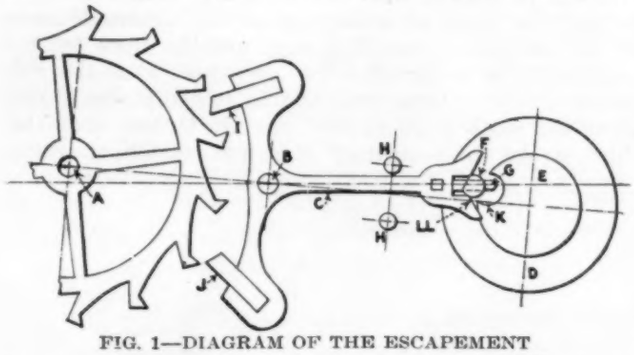



FIG. 1—DIAGRAM OF THE ESCAPEMENT

impulse pin, and the roller or rollers. The balance itself is not properly included.

In Fig. 1 is shown a diagram of the movement, the letters referring to the various parts as follows: *A* is the escapement wheel; *B*, the pallet; *C*, the fork; *D*, the impulse roller; *E*, the safety roller; *F*, the impulse pin; *G*, the guard pin; *HH*, the banking pins; *I*, the receiving, or right, stone; *J*, the discharging, or left, stone; *K*, the roller crescent; and *LL*, the fork horns.

As may be seen in the sketch, the pallet is the part that holds the stones that lock and unlock the teeth of the escapement wheel, causing it to move intermittently. The forward and backward movement of the pallet, a movement governed by the balance but which really derives its actuating impulse from the escapement wheel, is what times the watch. If the pallet should be inaccurate in regard to any one of its many features, such as the position of the arbor hole, a wrong position or angle of the slots that hold the stones, or the fork horns not being punched in exactly the right place or at the correct angle, the timing would be defective.

In Fig. 2 is shown a drawing of the pallet, which will serve to show how truly complicated is its design. There are many styles and kinds of pallet, each design involving an amount of calculation that would astonish the uninitiated; yet the slightest error in any one of the many calculations would greatly affect the value of the watch as a time-keeper. The writer has handled

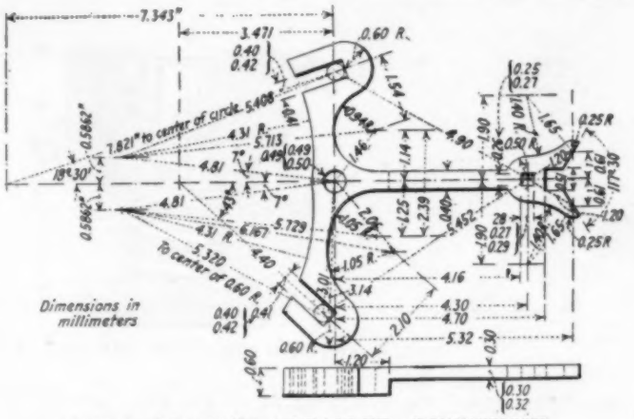



FIG. 2—DRAWING OF PALLET. DIMENSIONS IN MILLIMETERS

Swiss watches that were guaranteed to keep time within 15 seconds fast to 20 seconds slow in 24 hours, a variation so slight that it is hardly appreciated by the average watch-owner. Slight as this variation is, however, it can be improved upon and the watch factories of today are working toward that end.

In Fig. 3 is shown the way in which the stock is shaved before it is fed to the die. The stock used is strip brass 1⅛ in. wide by 0.024 in. thick, and comes to this operation in 6-ft. strips. The strip is run through the blanking tools twice, as will be explained later.

A three-station die, mounted in a pillar-type subpress, is used to blank the pallet, and in Fig. 4 may be seen a section taken through the second station. At the first station the two pilot holes and the pallet-arbor hole are pierced, and a part of the stock cut away around the fork horns to relieve the blanking tools of a part of the burden. At the second station the pallet is blanked out of the stock, but is immediately pushed back into it again by the action of the shedder on the up-stroke of the press. At the third station the completed blank is pushed out of the stock and falls through the die into a receptacle beneath the press.

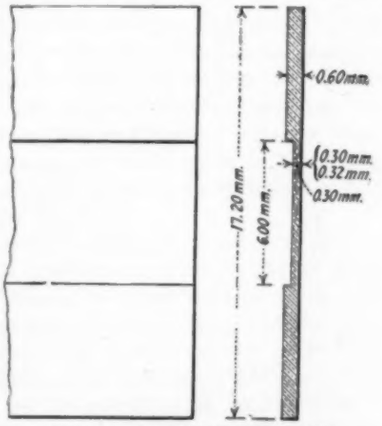



FIG. 3—STOCK PREPARED FOR BLANKING

Part *A* is the die holder, made of machine steel and pack-hardened; part *B* is the blanking die, which is made of tool steel in three pieces; part *C* is the shedder,

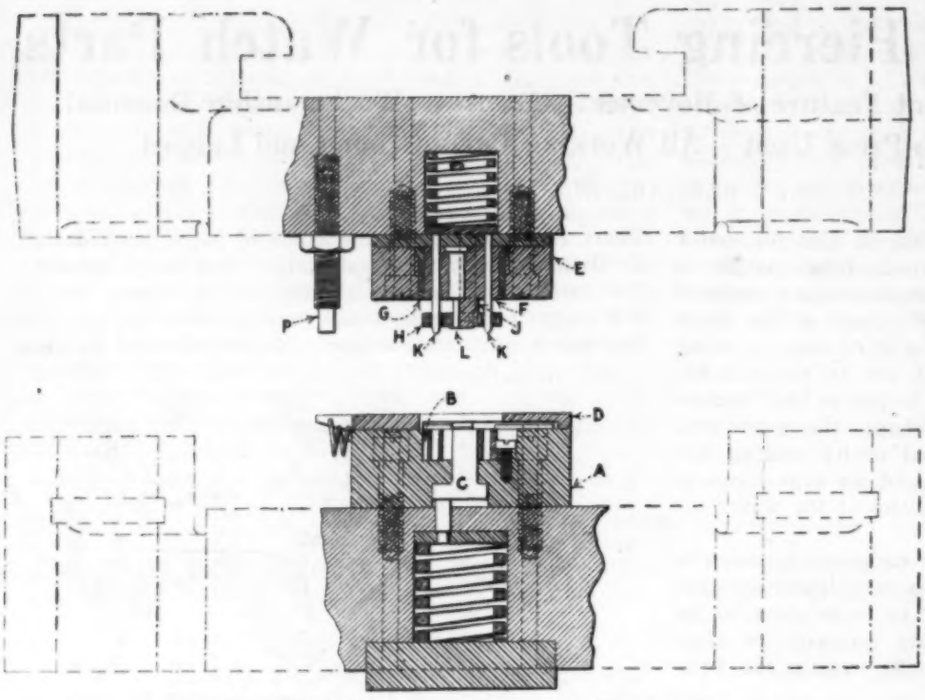



FIG. 4—SECTION THROUGH THE BLANKING DIES

also of tool steel and a sliding fit in the die; part *D* is the stripper, made of machine steel, pack-hardened and provided with a runner as shown in the drawing so that the shaved portion of the stock will always bear against a straight-edge to prevent mis-alignment while piercing and blanking.

Part *E* is the punch block, made of machine steel and pack-hardened. Part *F* is the blanking punch, the body portion of which is ground and lapped to a drive fit in the bushing *G* of the punch holder, while the punch portion is made to correspond to the contour of the die but is 0.012 mm. smaller all around than the latter. Part *H* is a spring stripper, made of tool steel, hardened, and ground out to fit the blanking and piercing punches, and it is retained in place by three screws, part *J*.

Parts *KK* are the pilots, made of tool steel, hardened, ground and lapped to a drive fit in *F* and a sliding fit in the bushed holes of the stripper. On the downward stroke of the press the blanking punch *F*, the gutting punch *L*, and the pilots *KK* enter the blanking die, compressing the stripper and shedder springs. On the up-stroke the blank, which at this time is out of the stock and lodged in the die, is pushed back into the stock by the shedder, through the action of its spring.

In Fig. 5 is shown a plan view of the blanking dies. Here may clearly be seen what operations take place in each of the three stations.

It will be noticed that two stops are used. In order to feed the stock accurately up to the automatic stop *M*, the temporary stop *N* is used and the stock fed by hand until the automatic stop is reached, when the roll feed is thrown into action. On the second stroke of the press the stock is pulled over the pin *O*, and upon the third stroke the temporary stop *N*, a sketch of which

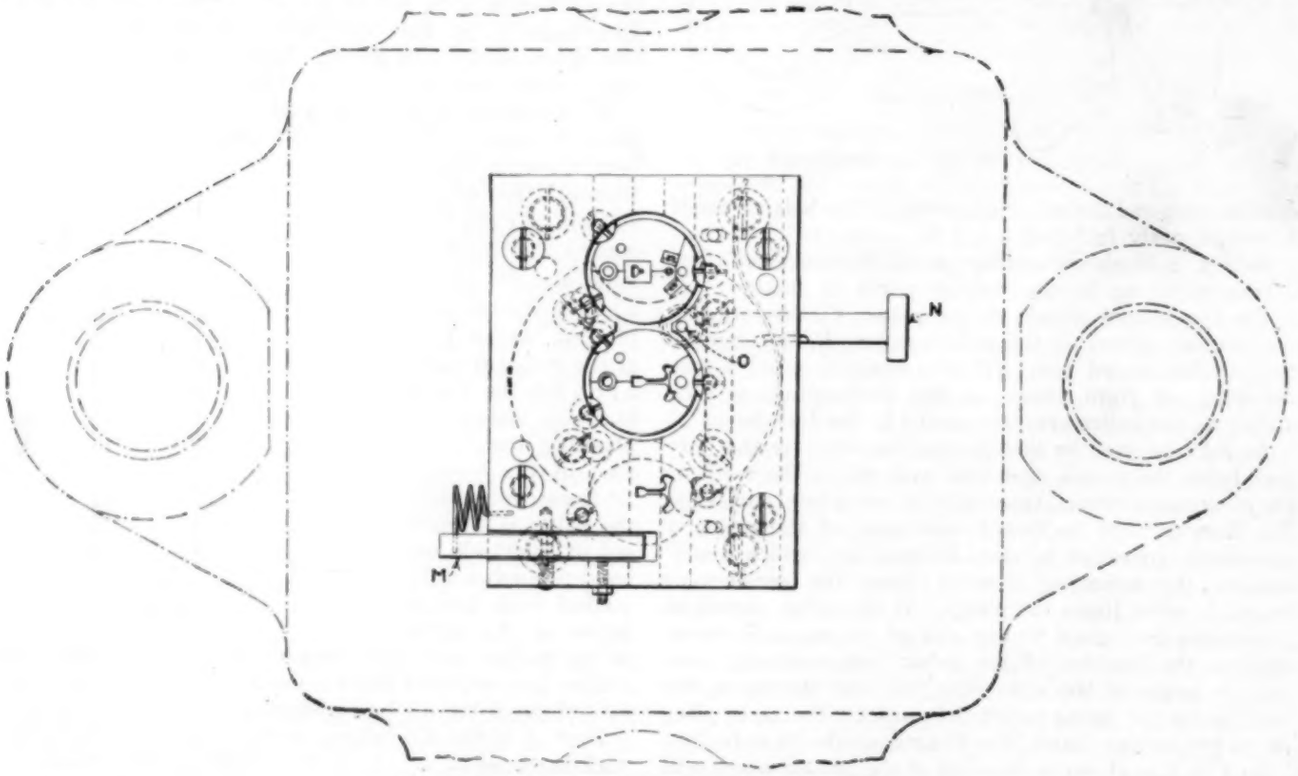



FIG. 5—PLAN VIEW OF THE BLANKING DIES

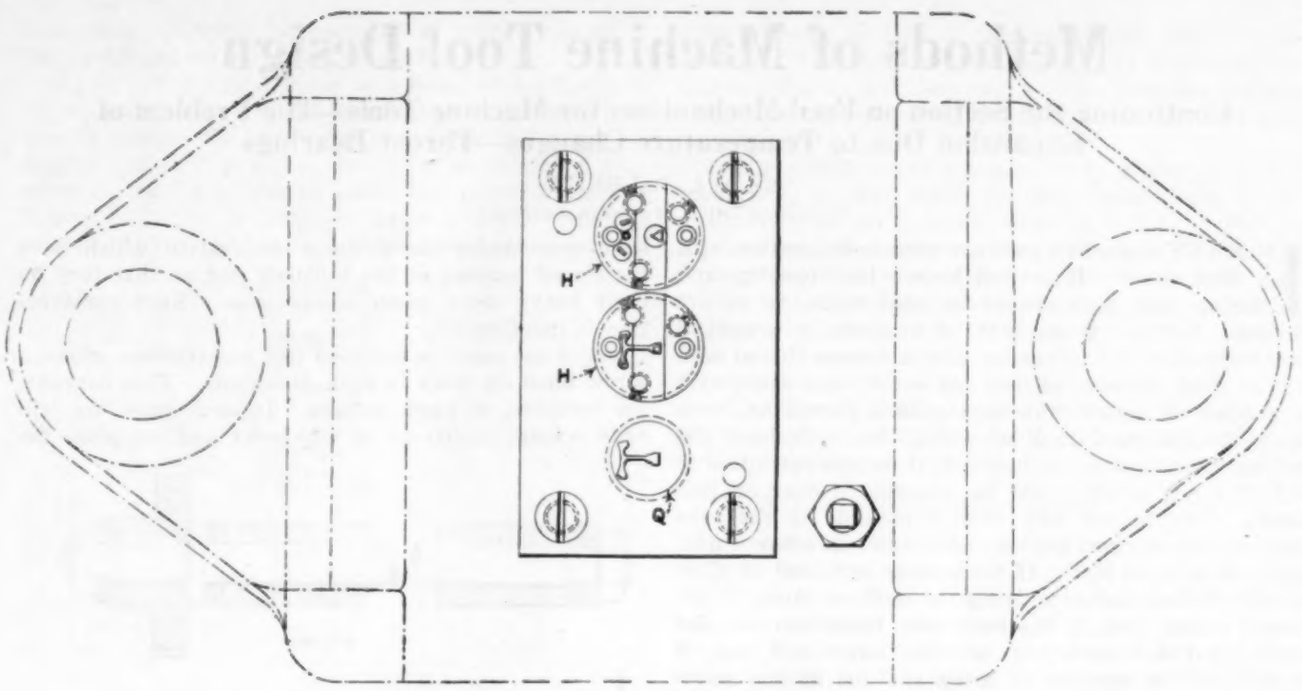



FIG. 7—PLAN OF THE PUNCHES

appears in Fig. 6, is pushed in, causing the pin *O* to go below the surface of the die. The automatic stop is of the trigger type with a projecting end against which the adjustable screw *P* (Fig. 4) contacts as the press descends.

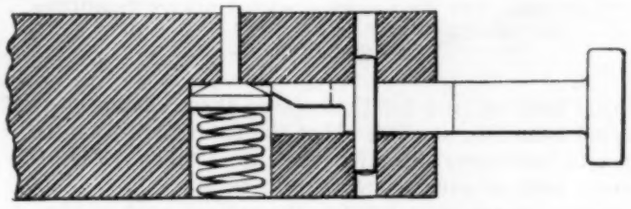


FIG. 6—DETAIL OF AUXILIARY STOP

In Fig. 7 is shown a plan view of the punch block. Here may be seen the two spring strippers, parts *HH*. The knock-out punch *Q* is made to conform to the contour of its die, but is 0.05 mm. smaller.

In Fig. 8 is a sectional view showing the construction of the piercing and gutting punches. The two outside punches *RR* are the piercing punches for the pilot holes and are lapped to a driving fit in the punch holder. The piercing punches *S* and *T* and the gutting punch *U* are a driving fit in the punch holder and a sliding fit in the stripper bushings.

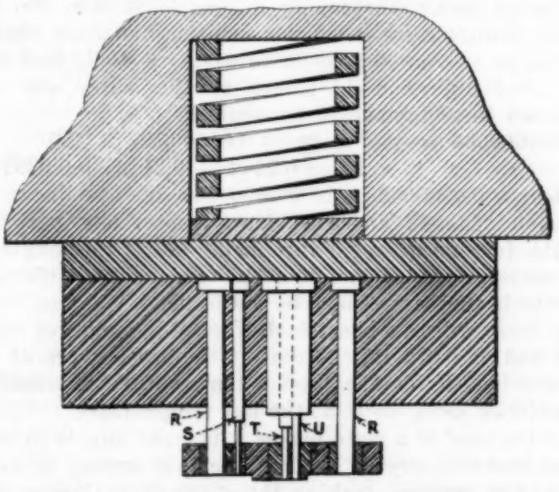



FIG. 8—SECTION THROUGH STRIPPERS

Very little trouble was experienced from breakage of the punches in using this die because of the fact that they were fully supported by the strippers during the time of cutting.

## The Foreman and the Management—Discussion

BY ARTHUR SEEKAY
Lynford Gardens, Essex, England

On page 898, vol. 56 of *American Machinist*, A. W. Brown attempts to define in a few words the position of the foreman in regard to the management. In my opinion no hard and fast rule can be laid down on this subject. I am convinced, by experience, that in small shops, employing anywhere up to 300 hands, the foreman must, without any qualifying clause, take part in the management of the works.

Much depends upon the efficiency and sagacity of the management, as a matter of course, but it must be acknowledged that there is often lack of consideration for the foreman and, in such case, the foreman should watch the interests of those working under him. He is in the best position to understand their temperaments and troubles. On the other hand, by refusing to associate himself with silly grievances and petty demands he can often overcome trouble and save his managers much loss of time and temper.

There should be no question of "running with the hare and chasing with the hounds." If he fails to determine what is right and just, or to exert his influence to achieve those ends which are proper, he will never have the confidence of either side.

# Methods of Machine Tool Design

## Continuing the Section on Feed Mechanisms for Machine Tools—The Problem of Expansion Due to Temperature Changes—Thrust Bearings

BY A. L. DELEEUW
Consulting Editor, *American Machinist*

IN MANY cases half nuts are used in connection with a feed screw. It is well known that opening and closing half nuts cannot be used with the square thread. Without going into an analysis or graphical demonstration of the reason why a square thread cannot be used, we may picture for ourselves a shaft with a number of square threaded collars turned on it—a kind of cylindrical rack of which the teeth have the contour of a square. A half nut, if we are permitted to call it a nut at all, could be brought to bear on this shaft. The reason why this is possible is that the threads are at right angles to the axis; in other words, that there is no lead. If there were any lead at all it would not be possible to bring the half nut down on the screw except that, if the lead were inconsiderable and some clearance were left between screw and nut, it would still be possible to bring the nut on the screw simply because there would not be a true fit between the two. If there were such a fit we could overcome the difficulty by making the thread slightly taper, say with an angle of one or two degrees on a side. We would have to increase this angle when we increase the lead.

The Acme thread has sufficient angle to permit of throwing in the half nut with most ordinary leads. However, when we try to obtain greater efficiency of the screw by increasing the lead, as we should, we may find interference between screw and nut. This interference is greatest at the points of the half nuts where they join, and it is quite customary to bevel the half nuts as shown in Fig. 154. Even this is not sufficient with large leads, or as we should rather say, with large angles of helix. If, for any reason, we do not wish to increase the angle of the thread beyond a certain amount—for instance, we wish to use the Acme thread—we will find that we are not permitted to use an angle of helix beyond a certain point; and if this would not give us a sufficient lead, then we would have to increase the diameter of the screw. In many machine tools very long screws must be used. Such screws should always be arranged to have them in tension when under load. Buckling effect, as a result of being in compression, will cause the screw to bind hard in its nut and in the bearings, besides being liable to cause severe jumping of the tools, as a screw would act very much like a spring. In lathes where practically all cuts are taken toward the headstock, this condition is automatically met, because the logical place to have a thrust bearing for such a screw is at the headstock end. Nothwithstanding this natural way of constructing the screw, some screws of heavy lathes have come under the writer's observation which have the thrust bearing at the tailstock end, so that they do their heavy work under compression. Such construction is indefensible.

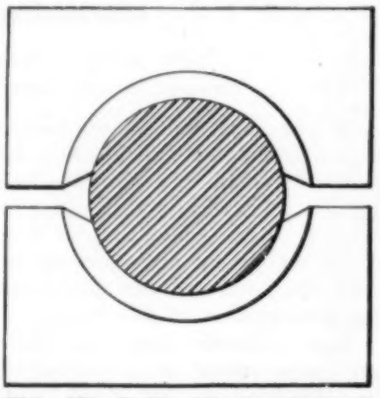


FIG. 154—PAIR OF HALF NUTS WITH BEVELED EDGES

There are cases in machine tool construction where a screw must do work in both directions. This happens, for instance, in plate planers. In such cases we will have wrong conditions at whichever end we place the thrust bearing, and for that reason there should be two thrust bearings, so placed that the screw will be in tension in whichever direction the cut is taken. Fig. 155 shows such an arrangement in diagram.

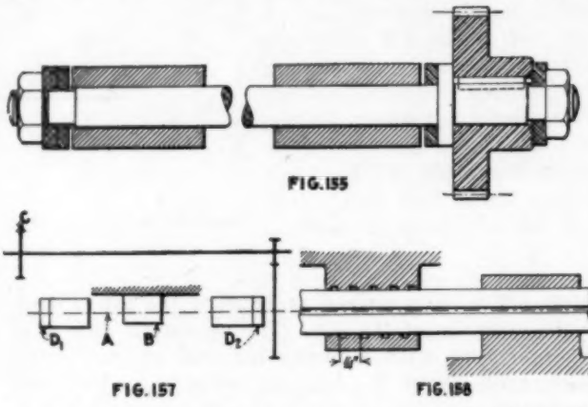



FIG. 155—PLATE PLANER LEAD SCREW WITH TWO THRUST BEARINGS. FIG. 157—FEED SCREW DRIVEN THROUGH SEPARATE SHAFT. FIG. 158—LEAD SCREW USED AS FEED ROD

There is no necessity for the use of such a thrust bearing arrangement except when the screw is fairly long, and when this is the case we may find that there is enough difference in expansion and contraction between the screw and the frame of the machine to require special attention. If, for instance, the length of this screw between the thrust bearings is 40 ft. and if the highest temperature to which this screw may be subjected under working conditions is 90 deg. and the lowest temperature when the shop is shut down during the night or over Sunday is 10 deg., we would find that the total difference in length of the screw and bed between these temperatures would be

$$0.00000636 \times 480 \times 80 - 0.00000556 \times 480 \times 80 = 0.2442 - 0.2135 = 0.0307;$$

in which 0.00000636 and 0.00000557 are the linear expansion of steel and cast iron respectively per unit length for one degree Fahrenheit; 480 is the length of the screw in inches, and 80 is the temperature difference to which the screw may be subjected. We find, then, that there will be a possible difference in length of screw and bed of 0.030 in.; so that if the screw were of the proper length for the higher temperature it would be practically $\frac{1}{32}$ in. short at the low temperature.

In the case of a plate planer it is quite simple to overcome this difficulty by leaving a certain amount of looseness; for instance, making the screw $\frac{1}{32}$ in. longer than the distance between the thrust bearings on the bed.

This looseness would be taken up at every reversal of the stroke and no harm would result.

In the case of a feed screw on a lathe, where it should be necessary to have thrust bearings at both ends (which is only rarely the case) the same method might be applied. If such a screw also must be used as a lead screw it it not advisable to follow this construction and it may be better to give the screw a length which is correct, not exactly for the highest temperature, but for

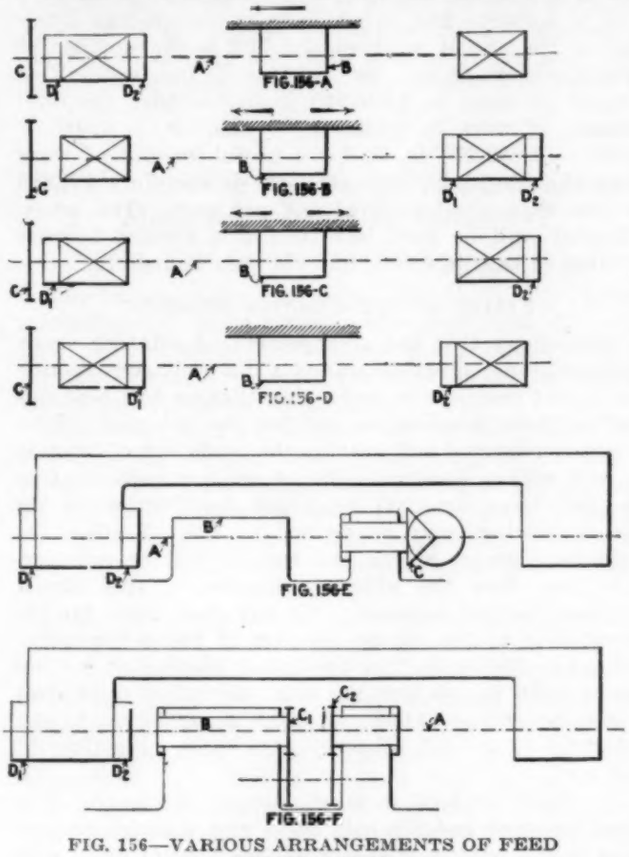



FIG. 156—VARIOUS ARRANGEMENTS OF FEED SCREW PARTS

the average temperature in the shop, say 65 deg. There might then be a looseness due to 25 deg. difference in temperature during hot summer days, whereas during a cold winter night there might be a difference in the opposite direction of 55 deg.

Under these latter conditions the screw would be subjected to a certain amount of tension, due to the fact that there would be a difference of 0.020 in. in length between the bed and screw. If the material of this screw had a modulus of elasticity of 30,000,000 lb., this difference in length would cause a stress in the screw of $20/480 \times .001 \times 30{,}000{,}000 = 1{,}250$ lb. to the square inch. This amount is not harmful to the screw, but adds very largely to the pressure on the thrust bearings. If, for instance, we should have a screw of which the core is $2\frac{1}{2}$ in. in diameter and therefore has a cross section of 4.9 sq.in., there would be an added pressure on the thrust bearings of $4.9 \times 1{,}250$ lb. $= 6{,}125$ lb., and it would therefore be necessary to have a much enlarged thrust bearing or much heavier ball bearings, or perhaps an entirely different arrangement to take up the thrust.

In Fig. 156-A to -F are shown various arrangements of feed screw, nut, driving gear, and thrust collars. In Fig. 156-A the thrust collars are placed close to the driving gear, so that if the feed takes place in the direction of the arrow the screw will be in tension, the thrust collar $D_1$ will function, and the distance between the driving gear and the active thrust collar will be a minimum.

In Fig. 156-B the thrust is taken up at the far end of the screw, so that when the feed takes place in the direction of arrow 1, thrust collar $D_1$ will be active and the screw will be in compression. There is, of course, a certain amount of torsion in the screw between the gear $C$ and the nut $B$ on account of the load and the friction in the nut; but in this arrangement of the elements there will be additional torsion due to the load at the thrust bearing. When the feed takes place in the direction of arrow 2, thrust collar $D_2$ is active, the screw is in compression and again is subjected to the additional torsion caused by the friction of the thrust bearing.

### Expansion and Contraction of Screw

In Fig. 156-C the thrust bearings are so located that the screw is always in tension in whatever direction the feed may take place. In this construction provision must be made for expansion and contraction. When the feed takes place in the direction of arrow 2, the entire length of the screw is in torsion due to the driving gear and thrust collar being at opposite ends of the feed screw. There are cases where a feed screw must be kept of small diameter; for instance, where it has to be laid in a long boring bar. In such a case the torsion of the screw is quite considerable, causing a shortening of the screw which, in its turn, causes a considerable pull on the far thrust bearing. This pull may become so great that, if the screw were driven by a pulley instead of a spur gear as shown in the illustration, the belt might not be able to turn the screw, and that notwithstanding the legitimate load might be quite small. This is a case of building up of resistance which we often meet in machinery where the elements have not been properly designed.

There are cases where it is unavoidable to have the thrust bearing at the far end of the screw and where it is not possible to make the screw as heavy as might be desirable. In such a case it is well to take the driving member $C$ off the screw and place it on a separate parallel shaft, and then drive the screw at the far end close to its thrust bearing; see Fig. 157. Though the total amount of torsion has been increased, there is no tendency here to build up. Fig. 156-D is practically the same arrangement as that shown in Fig. 156-C, except that the thrust collars are placed on the opposite side of the bearings. This construction brings the screw in compression at all times, and we could hardly imagine any case where it would be justified.

### Screw Fixed and Nut Rotating

In the foregoing four cases the screw was being driven while the nut was fastened to the member which was to be advanced. It is equally possible to have the screw held in the member to be advanced. This case is shown in Fig. 156-E. The sleeve bevel gear $C$ drives the screw which, of course, must be provided with a spline. It is undesirable to use a splined screw, though there may be cases where such may be the best possible compromise. This matter of splined screws will be touched upon later. In all the foregoing cases the screw was the rotating member. It is, of course, possible to have the nut rotate, in which case the thrust bearing must be at the nut and not at the screw. This con-

struction has the advantage of avoiding all torsion in the screw with its consequent change of lead, and of having the thrust close to the drive, and therefore never exaggerated by torsion in the driven member.

It is also possible to drive both screw and nut, as indicated in diagrammatic form in Fig. 156-F. In that event both screw and nut must be provided with thrust bearings. The rapidity of the feed depends on the difference in speeds of screw and nut. If, in the case illustrated, the screw had a right-hand thread, were rotating alone, and in a right-hand direction, it would cause the table to move to the right. If the lead were ½ in. and its speed 300 r.p.m., the rapidity of the feed would be 150 in. per minute and in a right-hand direction. If the nut alone were revolving, and also in a right-hand direction and at a speed of 300 r.p.m., the rapidity of the feed would be again 150 in. per minute, but this time in a left-hand direction.

If both screw and nut were revolving simultaneously with the same speed and in the same direction, there would be no feed at all; if in the opposite direction the feed would be 300 in. to the right or left, according to whether the screw would be rotating right- or left-hand. If screw and nut were revolving in the same direction, but at different speeds, the feed would be equal to the difference of the feeds which would be obtained if either of the two members were running alone and in the direction which would be caused if the fastest member only were running. For instance, if the screw were running 300 r.p.m. and the nut 280 r.p.m., we would obtain 10 in. feed per minute in the direction of the feed which would be given by the screw alone, that is, right handed. If, on the other hand, the screw were running 280 r.p.m. and the nut 300 r.p.m., the feed would again be 10 in. per minute, but in the opposite direction.

Such an arrangement lends itself very well for various functions of automatic machines, as rapid traverse in either direction, feed in either direction, and stopping all can be obtained with simple members. It should be noted, however, that it is necessary to lock the stationary member against rotation caused by the friction between it and the rotating member.

### Bearing Requirements

It is of the greatest importance to arrange for the proper thrust bearings, and in general for the elimination of friction when using the arangement of rotating screw and nut. We will suppose the screw to run 300 r.p.m. and the nut 298 r.p.m., which will give 1 in. feed per minute if the lead of the screw is ½ in. as was assumed. In order to feed 1 in. the screw must make 300 revolution under the full feed pressure, and the nut at the same time must make 298 revolutions under the same pressure.

To show how very inefficient such a drive would be, we will select a concrete example, making the screw 2 in. in diameter, ½ in. lead, single thread, and therefore with a pitch diameter of 1¾ in. We will assume the load to be 4,000 lb., the thrust washers on the nut to have an inside diameter of 1¾ in. and outside diameter of 3¾ in., while the thrust washers on the nut will have an inside diameter of 2½ in. and an outside diameter of 4½ in. Then the amount of work done for advancing the load 1 in. will be 4,000 in.-lb. As the screw has rotated in the nut 2 revolutions for 1 in. advance, the work done for overcoming friction in the nut will be $5\frac{1}{2} \times 0.15 \times 4{,}000 \times 2 = 6{,}600$ in.-lb. ($5\frac{1}{2}$ is the pitch circumference of the screw and 0.15 the coefficient of friction of the screw in nut).

The work done for overcoming friction at the thrust washers of the screw is $11/4 \times 22/7 \times 0.08 \times 4{,}000 \times 300$, in which 11/4 is the average diameter of the thrust washer, 300 the number of revolutions of the thrust washers for 1 in. feed, and 0.008 the coefficient of friction of the thrust washers. This amount is equal to 829,710 in.-lb. The work done for overcoming the friction at the thrust washers for the nut is $3\frac{1}{2} \times 22/7 \times 0.08 \times 4{,}000 \times 298$, in which $3\frac{1}{2}$ is the average diameter of the thrust washers and 298 is the number of revolutions made by the nut for 1 in. feed. This amount is equal to 1,048,960 in.-lb., so that the total amount of work is $1{,}048{,}960 + 829{,}710 + 6{,}600 + 4{,}000 = 1{,}889{,}270$ in.-lb. for a useful amount of work done of 4,000 in.-lb. The efficiency is therefore 4/1,889 or less than one-fourth of one per cent. The actual efficiency will be even less than this amount because friction in bearings, etc., has not been figured in.

### Effect of Anti-Friction Bearings

This shows that the arrangement of rotating screw and nut is not practical unless a different construction for thrust bearings is used. Substituting ball bearings for the thrust washers, we will find the following: With a well constructed ball bearing the coefficient of friction is well within one-hundredth of one per cent, so that the two large amounts we found for friction in the thrust bearings may be divided by 800. Besides, the average diameter of the ball bearing will be considerably less than the average diameter of the thrust washers we had assumed. We will find, then, for the work done at the thrust bearing of the screw something like 800 in.-lb.; for the thrust bearing at the nut about 1,000 lb.; so that the total amount of work done would be $800 + 1{,}000 + 6{,}600 + 4{,}000 = 12{,}400$, which gives a total efficiency of a little more than 30 per cent.

It should be kept in mind that all the figures here were assumed and are only fit to give a rough impression of the relative efficiency of this kind of drive with and without ball bearings as compared to that of the ordinary feed screw. When it comes to actual construction, the designer should carefully investigate the data and not accept the rough figures taken here.

Feed screws are often constructed with a spline. This spline is sometimes used to drive the screw and sometimes for the purpose of driving some other part by the screw. The splined screw is often condemned indiscriminately and without considering the purpose of the spline. If the spline is merely for the purpose of driving the screw and if conditions are otherwise as they should be, there is little to be said against such a construction. The points to be considered to make such a drive successful are: In the first place, the careful removal of all burrs where the threads of the screw meet the spline. Preferably these threads should be rounded over slightly for a short distance. In the second place, the length of key should be sufficient to make up for the fact that its bearing surface has been reduced by the threads. In the third place, the key should be of hardened steel if possible.

We have a different set of conditions when the screw drives some other member. As illustration we may take the quite common construction of a lathe apron in which the screw is used both as lead screw and as feed rod. When used in this latter capacity the screw drives

some gear which is used to transmit motion to the rack pinion. Such a screw must have one or two bearings in the apron besides the half nuts. To make clear what will happen when such a screw is used for these different purposes we shall assume certain figures, see Fig. 158. The lead of the screw is supposed to be ¼ in. and we shall further suppose that it is geared in such a manner to the rack opinion that one revolution of the screw causes an advance of $\frac{1}{16}$ in. when it is used as a feed rod.

When the screw is used as a lead screw it will cause an advance of ¼ in. per revolution. As the bearings in the apron advance the same amount as the half nuts, namely ¼ in. per revolution, the screw will travel in these bearings just as if they were nuts and it will cause the wear in these bearings to take the form of a shallow thread. If now later on the same screw is used as a feed rod, it will cause the apron with its bearings to advance $\frac{1}{16}$ in. so that the edges of the thread of the screw will act as cutting tools and cut out the thread worn in the bearings. This action will be repeated and it will be only a very short time before the screw will be very loose in its bearings, will be practically unsupported, and will cause looseness in the subsequent gearing. A lead screw should not be used as a feed rod.

On the other hand it is permissible to drive a screw by means of a spline, whether it is used for feed only or for producing the lead in screw cutting.

## What Are the Worker's Prospects in the Machinery Building Industry?

BY GAYLORD G. THOMPSON

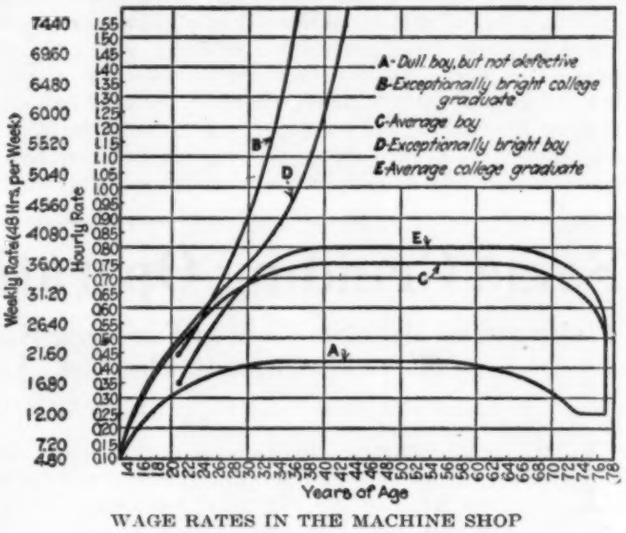
The article under the above title by A. W. Forbes, appearing in the *American Machinist*, Vol. 55, page 667, is an excellent preliminary to the possibilities of developing standard curves for ascertaining the impartial monetary valuation of labor.

I am submitting a drawing of curves which takes into consideration not only the starting point of a worker's career, but also the approximate ending of his services. In fact these curves represent the periods of increased returns, constant returns, and diminishing returns, as they concern the value of the worker's period of uninterrupted service to the employer.

In analyzing the proportional values of the curves as submitted by Mr. Forbes, I have come across an element wherein the "exceptionally bright boy starting machine work at fourteen years of age," is given considerable advantage over the "exceptionally bright boy entering machine industry after graduating from college." Apparently, Mr. Forbes contends that a bright boy beginning at fourteen years of age and working three years until seventeen years of age, is of the same value to a concern as a bright boy graduating from college at the age of twenty-two years.

It is hard to conceive of any concern that would place a higher monetary value on a boy of seventeen years old with three years machine work experience, than on a matured young man of twenty-two years, a graduate from college. Picture these two young men standing before you. You have their applications for a position. On reading over their outline of experiences you could not evade the impulse to concentrate your attention to the college graduate. He already has the foundation upon which to build rapidly, the particular structure that may fit him in as an important cog in your organization. Of course the college graduate will be hired in preference to the seventeen-year old boy especially when the wage rate is equal. Even though a bright seventeen-year old boy who has worked for you for three years is unconciously drawn into the controversy as a basis of comparison with the college graduate for labor value, you would still feel that you were grabbing a bargain if this technically trained man would start work for the same amount paid to the seventeen-year-old boy.

The argument may be advanced, however, that a worker who has been with a company for a number of years is of more value to a concern from a production point of view, than a recent college graduate who is not familiar with the manufacturing methods of that particular concern. I believe this to be true only when the shop man has gone through a sufficient number of years training that will in a measure counteract the advantage which the college graduate has in his technical training. We must not lose sight of the fact that college graduates who intend entering the machinery manufacturing industry are considerably advanced in actual manufacturing experience due to the intensive training which they receive in machine shop practice during their




WAGE RATES IN THE MACHINE SHOP

school terms and summer vacations. Consequently, when such men enter into the manufacturing field, their rise, starting from a slightly lower level than the existing wage rate of the exceptionally bright worker and on equal footing with the ordinary worker, is more rapid than these two classes of workers. The lines of valuation should converge. The line representing the most rapid increase in value of service will cross all others that are the nearest competitors. This line, which represents an exceptionally bright college graduate, is shown in the accompanying chart as *B*.

Line *D* represents an exceptionally bright boy who has found time to acquire technical training outside of his working hours. It will be noticed that this line does not show such rapid strides in the attainment of increased valuation of services as line *B*, until approximately six years after the same achievement has been accomplished by line *B*. Owing to the fact that *D* is compelled to obtain his technical training under conditions that do not allow him to devote his full time to

that phase of the work, he must necessarily be reconciled to the necessity of delayed realities of visualized ideals.

I believe that I voice the opinion of the majority in that the ultimate attainment of high remuneration is most quickly brought about through the instrumentality of a college education preceding practical experience.

The curves, as shown by Mr. Forbes, representing the college graduate ($C'$) and the exceptionally bright boy ($C$), are in my opinion directly opposite to the correct interpretation of them. It does not seem logical that the worker without college education preceding practical experience, should show quicker results than a college training supplemented by practical experience.

Line $C$ represents the ordinary worker who is content with being an all around machinist, toolmaker, or the head of some department whose functions contribute to office routine.

Curve $E$ represents the average college graduate who comes under the same category as curve $C$, but owing to his advantage of a college education his curve of service valuation should be more pronounced at the beginning and gradually terminating at a slightly higher stationary valuation than $C$. Likewise we have consistent relativity with curves $B$ and $D$.

Curve $A$ represents a worker lacking in college training, who is satisfied to remain in the class of a machine operator or clerk. In this class of workman, the element of physical ability is the barometer of labor valuation. In this curve it will be noticed that a slow increase in value is given from twenty-five to forty years old. I based this curve on the fact that unless the worker betters himself intellectually, whatever increase in value that he becomes to his employer will be only the result of length of service. After the worker becomes forty years of age, any longer service with the company could not qualify for increased valuation. From forty to fifty-eight years of age, the worker's value to the company from point of service remains stationary, after which the physical element enters into his value which brings about a decline in his value to the company until he strikes a low level which is in proportion to the value of the duties which he is able to perform. When an old worker ceases to be worth $12 per week, he should be removed from duty or placed on a pension.

The ends of curves $C$ and $E$ show a sharper decline than curve $A$ because of the fact that curves $C$ and $E$ savor of an element of brain work and skill which does not require the physical qualifications of curve $A$. Consequently the period of decreased labor valuation does not start until some time after $A$ and after declining slowly for a few years, suddenly drops to the low level. The class of workers represented by lines $C$ and $E$ are usually in a position to retire before the low limit has been reached.

The workers represented by curves $B$ and $D$ having once started their climb, do not encounter any great degree of stationary valuation, but on the contrary "carry on" until they retire or are called by death.

In summing up the whole proposition as to these curves on labor valuation, I have based my conclusions on the fact that the rapidity of absorbing knowledge is most pronounced in the first few years of learning and that it gradually tapers off until the highest value has been reached. Only technical training will reverse the curve and give it a sharp incline toward the pinnacle of increased returns.

I wonder what the moral effect would be to hang a large reproduction of these curves on the bulletin board in the office or shop with full explanations and headed, "Which of These Curves Represent You?"

# Some Grinding Operations at the Marmon Plant

## Fixtures and Methods Used in Finishing Gears, Valve-Stem Rollers, Valve Lifters, Steering Knuckles, Spring Shackles, Axle Housings and Connecting Rods

SPECIAL CORRESPONDENCE

THE accompanying illustrations give a good idea of the extensive use of grinding machines in building the Marmon car. Fig. 1 represents simply grinding the bore of a timing gear, and is only shown to illustrate the use of hardened pins for holding the gear at its pitch line in a draw-in chuck.

The grinding of the small rollers which go in the valve push rod is shown in Fig. 2. These rollers are held in the chuck $A$ by means of the sliding washer, which is tapered sufficiently to force them against a suitable seat at the back end. This is an easily handled device for work of this kind.

Two of the grinding operations on the push rod itself are shown in Figs. 3 and 4. The method of holding for the first grinding operation can be readily seen by examining the driving dogs at $A$ and $B$, Fig. 3. The dog at $B$ has a push rod in place and is all ready to be placed in the grinding machine. The use of inclined tracks, shown by the machine, makes it possible to pass work from one machine to the next.

Another grinding operation on the push rods is seen in Fig. 4, where the ends are being ground square by a cup wheel. The rod is easily clamped in the small fixture at $A$ and the operation proceeds very rapidly.

The somewhat unusual steering knuckle used in the Marmon car is shown in Fig. 5, where the portion which goes in the axle is being ground. This view shows the method of driving the knuckle for grinding.

Another unusual grinding job is shown in Fig. 6, where a spring shackle is being held on a magnetic chuck while the side is being faced by a cup wheel. The projecting portion of the shackle has been previously ground between centers, as shown in Fig. 7.

In Fig. 8 is shown how the sheet-steel rear axle housing is ground at the outer end for the wheel bearing. The end carries a plug which serves as a center.

The connecting rod and cap joints are carefully ground to insure a solid metal-to-metal seat. The fixtures used and the method of locating and clamping can be clearly seen in Fig. 9.

The valve rocker arm is being ground in Fig. 10, a simple fixture locating it and holding it in position. The cup wheel used has a long life on account of the depth of the cup.

The foregoing examples are by no means all of the interesting grinding operations in the Marmon shop, but will serve to show a few of the ways in which grinding methods are utilized on general work.

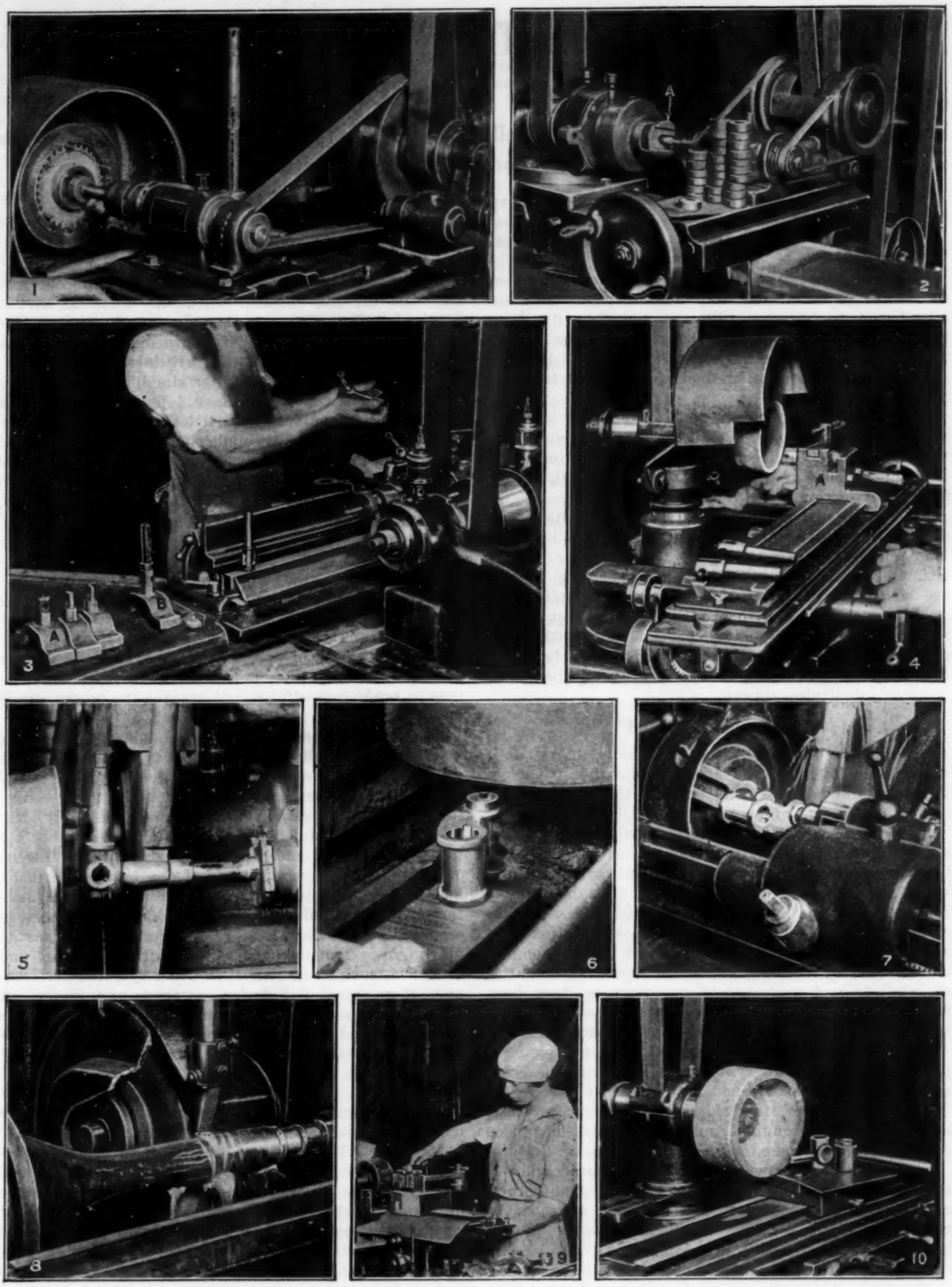


FIG. 1—GRINDING BORE OF GEAR. FIG. 2—GRINDING ROLLERS FOR VALVE ROD. FIG. 3—GRINDING VALVE RODS. FIG. 4—SQUARING THE ENDS OF PUSH RODS. FIG. 5—GRINDING THE STEERING KNUCKLE. FIG. 6—FACING SPRING SHACKLE. FIG. 7—GRINDING END OF SHACKLE. FIG. 8—GRINDING REAR AXLE HOUSING. FIG. 9—FINISHING CONNECTING ROD FACE. FIG. 10—GRINDING VALVE ROCKER

# Standardization from the Consumer's Point of View

## Standardization an Aid to Buying and Selling as Well as to Production—Different Kinds of Standardization—The Federal Specification Board

By N. F. Harriman
Technical Secretary, Federal Specifications Board
A paper presented at the National Exhibit of Chemical Industries, New York, Sept. 15.

In recent years, attention has been concentrated upon the material and mechanical side of production and distribution in industry. Physics and chemistry have revealed the secrets of raw materials and the modern manufacturer can determine the most suitable material and the most economical method of treating it to obtain the desired results.

One of the most modern sides of industry is standardization, now recognized as being of great importance to both producer and consumer. It is sometimes said that the benefits of standardization are mainly to the field of production.

This is actually not the case. They are quite as important to both the field of buying and of selling. In industrial standardization it is the consumer who is ultimately benefitted most but the immediate benefits are largely to the producer. It at once simplifies his work and enables him to produce what is required by the consumer cheaply and expeditiously. With lower production costs comes more extended use of the standard article. It is a law of economics that when costs increase substitutes appear.

### No Bar to Initiative

Objectors to standardization frequently urge that it would stifle initiative and progress and that the adoption of a standard prevents advance through improvements in the arts of manufacture. Of course, this is not the case. A standard should remain standard only until something better is developed but it should not be changed until justified from all points of view. Any given standard, to achieve its object, must be suitable for the intended use in the majority of cases. The exceptional case requires special consideration and actual perfection will never be attained. The economies and benefits of standardization, as applied to qualities of products and processes of manufacture, have been so thoroughly demonstrated within the past few years that they are entirely outside the argumentative field.

Standardization, like efficiency, is not an easy term to define. It is not always understood in its true sense and by many is looked upon with doubt and suspicion. The general idea of standards is not new but its application to science, engineering and industry has been developed within comparatively recent years.

Standardization may be defined as the unification of the methods and practices involved in manufacture, construction and industry, and all lines of endeavor which present the necessity of repetition work. It may be considered under several aspects.

Standardization of nomenclature enables buyer, seller, and manufacturer to use and understand the same language. It is very important that there be acceptable definitions of terms used in specifications and contracts. Purchasing is often done by persons who are quite familiar with the legal side of drawing up contracts but who are not familiar with the technical details involved. The efficiency of many purchasing officers is lessened by their lack of knowledge of the nature and names of the articles they are intrusted to buy.

Standardization of variety, or simplification, involves the elimination of unnecessary types, shapes, grades and sizes of manufactured articles. Waste in industry is largely due to on over-multiplicity in the number of products, as well as to inefficiency of process. Waste due to idle stocks of material and products through deterioration, obsolescence and capital charges carried, is large, especially with large stocks.

### Dimensional Standardization

Dimensional standardization ensures ready interchangeability of supplies, and the proper inter-working of parts which may be manufactured or assembled by different manufacturers.

Standardization of specifications and methods of test puts bids on as easily comparable basis, promotes fairness in trade competition, and ensures the proper grade of material for a given use.

The amount and intensity of standardization work now being done all over the world is surprising. One continually hears of "mass production" and the statement that the extensive introduction of it into industry, through standardization, is an economic necessity. National industrial and engineering standardizing bodies have been formed and are now functioning in fifteen of the most prominent nations of the world. Germany has been especially active in dimensional standardization, while the efforts of the British and American standardizing bodies have been directed more particularly toward matters concerned with purchases and contracts, such as specifications for materials, performance of machines and devices, methods of test, etc. A notable exception to this general statement is the dimensional standardization work of the automobile industry in this country.

### Many Applications

From a broad viewpoint, standardization may be applied to materials, methods, products and uses.

Materials—The raw materials used in the manufacture of a product must be of standard and uniform quality, if the process of manufacture and the grade of the product are to be maintained. Sometimes it costs a little more to adhere rigidly to definite standards for raw materials, but the economies effected offset this.

Methods—A product made continuously from standard grade material more readily permits standardization of each step in the process of production. This is attained by the adoption of the one best and most economical method of doing each thing as taught by

plant and engineering experience, and making it standard practice.

Product—A standardized product, made to definite specifications, permits an output to the maximum uniformity possible within the limits of manufacturing skill. A uniform product made and sold continuously permits a steady production schedule, building up stocks during periods of low demand and depleting them during periods of high demand. On the unstandardized basis, the only alternative is to follow the "feast and famine" method. The definitely standardized product is manufactured to meet particular wide needs, according to definite specifications, and is constantly tested to ensure its being up to standard grade. The ordinary purchaser is not an expert on quality of supplies, and in many cases the quality can be lowered and he would be none the wiser until the material is put into service.

Uses—One type, shape, grade or size of an article will not meet all the requirements of the consumer, neither is it desirable to have such an extensive variety that the differences are small and meaningless. The ideal condition is to have just enough variety to meet all the real needs with no overlapping. Sound industrial economy demands the elimination of the special or little used product and its substitution by the standard or most widely used and most efficiently produced goods.

### Specifications Standardized

Standardization of specifications is the most important phase of the subject, from the purchaser's viewpoint. It is the first and most essential step in the economy that arises from the purchase of materials or supplies in large quantities and is a necessary factor in the improvement of the quality of materials purchased and the adaptation of quality to definite uses.

The specification is the common meeting ground for the manufacturer, dealer and user and it is at once a statement of the users needs and what the maker is required to supply. Purchase by competitive bids on specifications is preferable to purchase on sample. The latter method implies that each bidder's product must be considered independently and it is often a very difficult matter to decide between different combinations of quality and price. The specification should include limiting values for the properties necessary to meet the required service, with proper tolerances. A correct specification is one which enables bidders to know exactly what is desired or required and what procedure the purchaser will follow to satisfy himself that the specification has been complied with. Defective and incomplete specifications, whether due to compromise of quality for temporary economy, or through lack of data, should be replaced by those in which the best magnitude of each property involved is so specified as to predetermine the definite quality best meeting the need. There is a growing appreciation of waste in industry due to the use of defective and improper materials.

To determine the value of any material for a given purpose, its properties must be measured, assuming that the proportion upon which its use depends are known and are measurable. The testing of materials may prove a needless waste of time, energy and money unless due consideration is given to the nature of the tests applied, the conditions under which they are made and the interpretation of results. Quality may be determined directly by a service test, indirectly by a test under simulated service conditions, or still less directly by a laboratory test of individual properties upon which the quality is known or assumed to depend. These may vary from a simple visual inspection to an investigation involving laboratory and technical work of the most difficult and precise nature. Friction and controversy between buyer and seller often arise as to the question of facts concerning the results of tests, especially when different methods or different equipment are used. Standardized methods of test consider all of these conditions, and are a necessary part of an ideal specification for a material or a manufactured article.

The United States Government is probably the largest purchaser of materials and supplies in the world and the greatest impetus that could be given to standardization from the purchaser's point of view would be for the Federal Government to adopt standard purchase specifications for the more important materials and supplies purchased by it. This has recently been initiated by the establishment of the Federal Specifications Board, in the office of the Bureau of the Budget, which has brought together the experts of the various departments. As a result specifications representing the best commercial and engineering practice are being selected for the use of all departments and bureaus alike in the purchase of supplies.

The selection and adoption of specifications or standards, without due regard to the manufacturing problems involved, would be equally as serious as for manufacturers to establish standards without a careful consideration of the needs of the purchaser. In the selection of specifications for Government use, the Federal Specifications Board is co-ordinating these two interests, and the standards adopted will eventually be used for all Government purchases. This procedure will undoubtedly serve as a model to be followed by corporations, municipalities, States and the general public.

With many large corporations, the standardization of purchases, and the resulting simplification of store stock varieties of materials offer a fertile field for economy. The purchasing officer with a technical knowledge of materials and supplies, together with a knowledge of standardization principles, is best equipped to secure maximum results.

## Change of Product

By A. W. Brown

There comes a time when the market for a product slumps or disappears. Hoop skirts are an example of such products. Cigars seem to be yielding place to cigarettes. Detached cuffs for men's shirts have almost disappeared from shops and laundries. Where are the bustles of yesteryear? And the men's long boots? And mittens, tall white beaver hats, "bone-breaker" bicycles, quill pens, letter-copying presses, bar fixtures, and dozens of other things?

So almost every factory may have to confront compulsory change of product. In emergencies, as in war time, they find it advantageous to drop their regular line and take something entirely different. In the Great War the stove foundry turned out shells while the type-writer plant made machine-gun parts.

It is then well for every factory to have a card up its sleeve and know what it would make for a change if its line of product went out of fashion or use. This is entirely independent of so-called "chink-in work," taken to fill up dull times in the regular line.

# Ideas from Practical Men

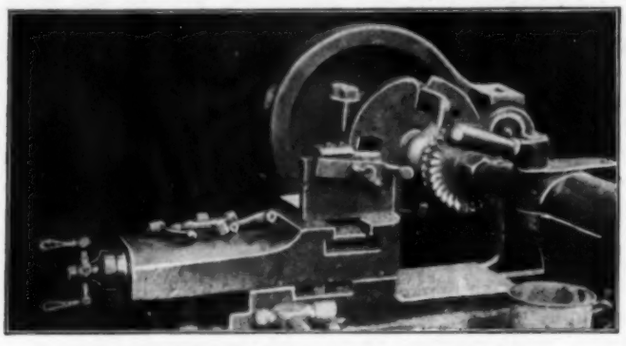
*Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.*

## Straddle-Milling in the Lathe

By Henry M. Clary

The job here described was observed in the plant of the Central Machine Co., Detroit, Michigan. A large lot of small drop forged steel accelerating levers came in to be milled on both sides of the small end, the finished dimension being ⅜ in. As all the milling machines were in use, a pair of side milling cutters was mounted on a nut arbor and put into an old Rahn-Carpenter lathe.

A pin was then screwed into a small angle plate, the



STRADDLE-MILLING IN THE LATHE

pin being of the diameter of the hole in the large end of the lever and so located that when the angle plate was bolted to the toolrest, the lever would be held in the position shown in the illustration. A block and thumb nut on a stud supplied the necessary clamping action. As the pin that held the lever was not over ½ in. long, one or two turns of the nut were sufficient to allow the work to be changed. A block attached to the end of the angle plate nearest the cutters served as a rest for the lever. The operator fed the work in and out by hand and obtained a production of 100 per hour.

## The Art of Milling in 1750—Discussion

By Matthew Harris

In an article under the above title by L. L. Thwing appearing on page 267 of *American Machinist*, Mr. Thwing draws the conclusion that the milling machine and cutter were the invention of a clock maker. By the same token it was a clock maker who devised the first universal milling machine, covering the principles of all such machines in use today.

Joseph R. Brown, originally a clock maker of Providence, R. I., invented the universal milling machine about 1861 or 1862. According to Professor Roe's "English and American Tool Builder," the first machine was built and sold to the Providence Tool Co. for making twist drills to be used in drilling the holes in percussion nipples for muskets. This was in 1862, at which time the Providence Tool Co. was engaged in a government contract for Civil War muskets.

## An Ordinary Rotary Table as an Indexing Device

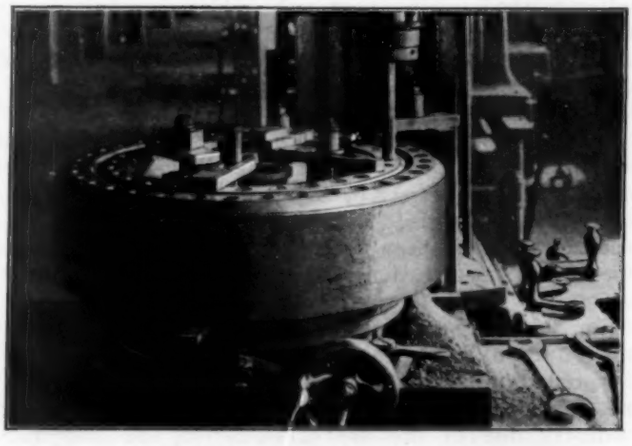
By J. M. Henry

The boring of a double circle of holes in a grinding fixture necessitated the use of an indexing device to locate the holes properly. The ordinary vertical milling machine, with rotary table, is neither large enough to handle the job, nor do the graduations on the table lend themselves to the required spacing. In addition to these reasons, the spindle of the machine is not considered sufficiently accurate as, although the spacing is not arbitrary to a minute degree, the holes when bored must stand perfectly square with the surface of the jig.

We found, by trial, that the handwheel of a Brown & Sharp rotary table in making one turn moved the table through an arc of three degrees. The outer circle of the work contained 36 holes and the inner one 28 holes, involving 3⅓ and 4⅔ turns of the handwheel respectively. We did need, therefore, to reduce our calculations to minutes of arc, but only to provide for thirds and sevenths in the rotation of the handwheel.

The logical solution of this was to divide the handwheel into 21 equal spaces and this was done by placing it upon an arbor between the indexing centers of the milling machine and using the regular dividing head.

A stationary mark for a point of departure was pro-



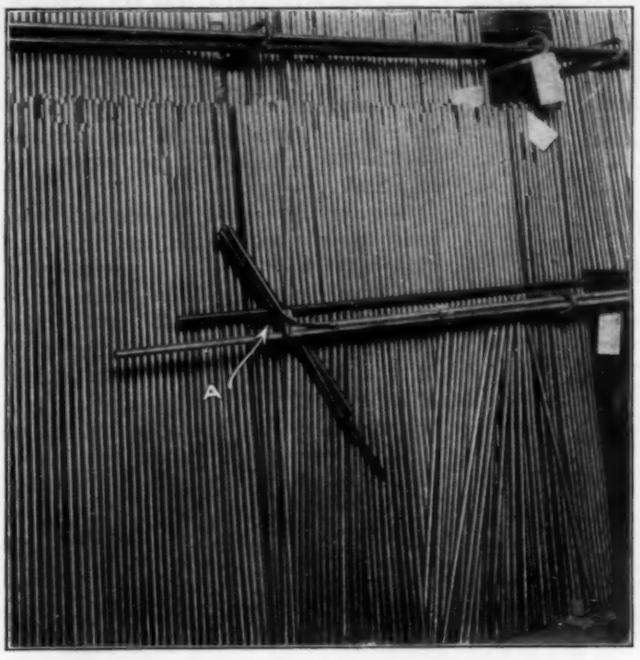
AN IMPROVISED INDEXING DEVICE

vided by clamping a suitable strip of sheet steel under a convenient screw head and scribing a line upon it, when the device was ready for service. The spacing for the holes of the outer circle was made by turning the handwheel 3 turns and 7 lines, while, for the inner circle, 4 turns and 18 lines were required. The holes were spotted, drilled, bored and reamed to a limit of accuracy in diameter of 0.00025 in. upon a Pratt & Whitney Jig Boring machine.

## Storing Screw Machine and Similar Stock

By Herbert Crawford

The illustration shows a convenient method of storing screw machine stock in a small space and with safety. The loops shown are welded to flat bases which are bolted to the plates of the rack. The loops have cross bars or partitions, as can be seen at *A*. The stock is




STORAGE RACK FOR BAR STOCK

placed on end against the rack and, when the bars are all in place, one or two bars are slipped through the loops to tie the bars in position and prevent their being pulled over forward. This rack is in use by the Hoover Suction Sweeper Company at its plant in Canton, Ohio.

## Improvised Forms for Coiling Pipe

By I. B. Rich

Here is a pipe bending or coiling kink I ran across in the Griffith Machine Works, Los Angeles, some time ago. This shop does much experimental work and this job had a long pipe, coiled into a sort of a bed spring effect as shown in Fig. 1. The trick was to coil the pipe with-

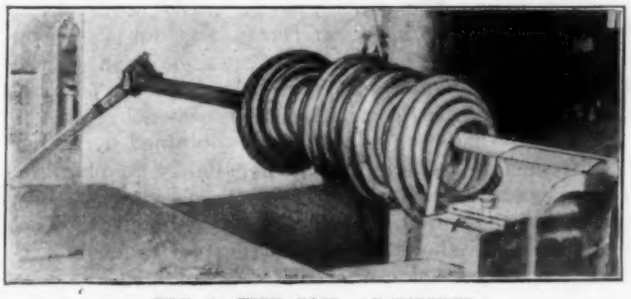


FIG. 1—THE COIL AS WOUND

out kinking it and to have the coils uniform in diameter and appearance. Like many difficult jobs, it was comparatively easy after you realized the correct way to go about it. Fig. 2 shows the way it was done.

A wooden form was turned up of the proper diameter

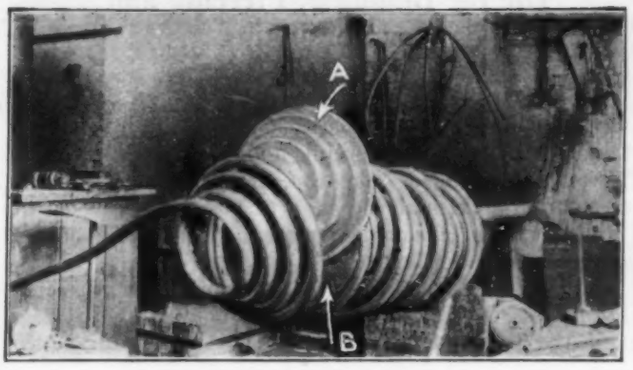



FIG. 2—REMOVING THE FORMS

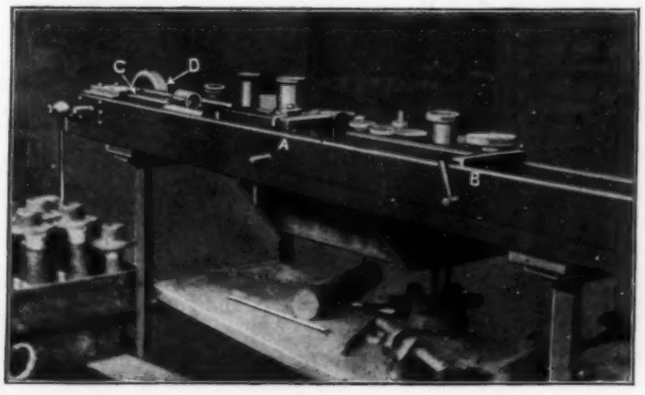
to make the desired shape and the outside had a spiral groove to match the pipe. These forms were made in two parts, as at *A* and *B*, the two halves making a complete double cone. The cones were placed on a mandrel to center them and the pipe wound around them as in Fig. 1. The coils were then spread enough to let half the form come out, as in Fig. 2, and both halves were removed through the same opening. The coils were then sprung back and there was no trace of the forms having been removed.

## Pressing Bushings on Long Rods

By Frank C. Hudson

Here is a useful little press which the Lucas Machine Tool Co., Cleveland, Ohio, uses to press bushings on the ends of long rods and screws. Instead of tapping the bushing on with a lead hammer and sometimes springing the screw, the screw is laid in suitable bearings, at *A* and *B*, and clamped fast. Then the bushing is placed on the end and forced on by a ram at *C*.

The ram is actuated by a pinion on a shaft which carries the wheel *D* on the other end. For rapid




PRESSING BUSHINGS ON SCREWS

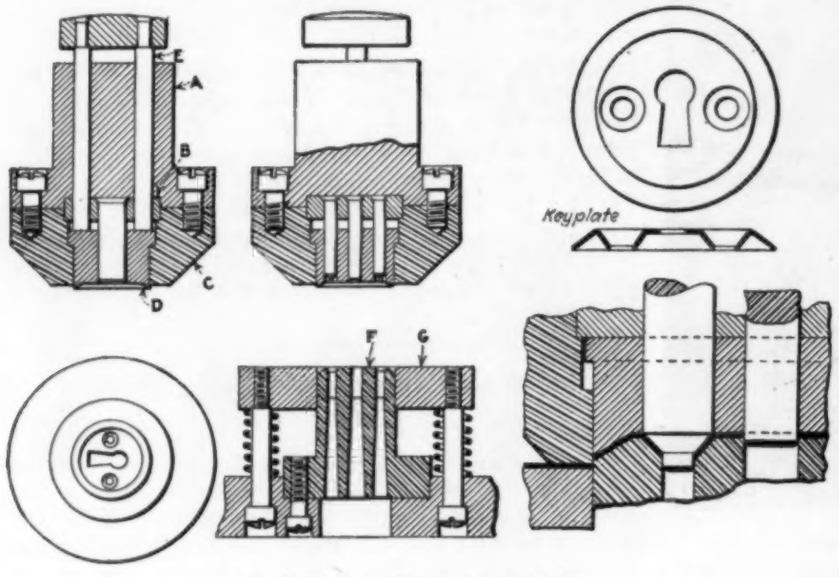
traverse the operating handle is placed on the pinion shaft and moves the gear direct. For power in forcing on the bushings another shaft is provided which carries a pinion meshing into an internal gear cut inside the wheel *D*. This arrangement gives a powerful gear ratio and has the advantage of operating in the same direc tion as the direct drive, which avoids confusing the operator. A ratchet wrench is used when desired, making it easy to get the pull at convenient angles. The holes in the side of the press show different positions at which the clamping blocks can be placed.

## Die for Blanking, Piercing and Countersinking

By S. A. McDonald

In the accompanying illustration is shown a small set of tools for blanking, piercing and forming a keyplate. The plate is blanked from the strip, the holes pierced and countersunk, and the edge of the plate beveled at a single stroke, a complete plate being thrown out at each movement of the press.

The die is of the inverted type and is constructed as follows: The machine steel die holder *A* is turned to fit the press slide and contains the piercing-punch




DIES FOR MAKING KEYPLATE

plate *B*, the blanking die *C*, and the knockout *D*. The double knockout stem *E* extends through the die holder and piercing-punch plate and rests on the knockout so that it moves with it.

The punch *F* is located in a plate which is bolted to the bolster of the press. The stripping ring *G* is secured around the punch by the filister-head screws which have the pressure springs on them as shown.

Two unusual features of this die are that the cutting edge of the punch is beveled to 30 deg. and the holes for the screws are countersunk to suit the angle of the flat head screws. This does not seem to affect the cutting of the dies.

An enlarged sectional view of the cutting edges just as the key plate has been struck is shown to the right.

The die operates as follows: When the die descends the countersunk holes are formed and as the movement continues, the screw holes are punched and at the same time the blank is cut. As soon as the blank is cut the knockout comes up against the plate *B*, so that the key plate is bumped on the punch. This sharpens up the angle of the bevels and gives the key plate a neat appearance.

On the up-stroke the stripper ring strips the stock from the punch and when the die nears the end of its stroke the knockout bar of the press forces the knockout stem down in the die against the knockout pad *D* and thus strips the key plate off the three punches.

As the press is inclined, the work falls down a chute through the back of the press while the scrap punchings pass through the bolster to a scrap can.

## Instructions to Workmen —Discussion

By T. Taylor
Chelmsford, England

In the *American Machinist*, page 954, Vol. 56, was published an article under the above title by C. J. Morrison. In it the author gives an instance of a workman who, by following instructions strictly to the letter, as given on the operation card, did not produce work as economically as might have been the case had the workman and shop superintendent been given the liberty to use their discretion and experience. The above example is not confined to America as I have experienced it since the war in one of the largest motor car works of England.

One of my jobs was machining brass magneto-platform castings, the sides of which must be milled central with the bore of the flange, providing true alignment with the magneto spindle. The first operation on the card issued by the planning office, called for boring and facing the flange. For operation two, the casting was bolted on the fixture on the milling machine table, locating the work from the bore. The sides and bottom were then milled, the workman trying to mill the two sides an equal distance from the center of the bore of the flange by repeated trial cuts and the use of gages. The result was that nearly always one side or the other was a few thousands out of center, although the instructions had been carefully followed throughout.

The next operation (not on the operation card) was closing in the sides in a strong vise to provide a little metal to rectify the job, known in the midlands as "doing Brummagen." Upon my suggestion to the shop superintendent that a better method would be to reverse the operations and first mill the sides and bottom, secondly bolting the casting on a jig, locating it from the sides, then bore and finish on a capstan lathe, the superintendent quite agreed that such should be the method but that unfortunately his hands were tied by the operation card issued by the planning office, under the control of the chief of that department, who has full authority.

I submit that the system of independent planning offices does not work for efficiency and for the shop superintendent or foremen to offer suggestion to the planning office is quite as disagreeable a job as offering suggestions or a little criticism to the drawing office.

I consider that best results can be obtained by giving the foremen the power and responsibility to plan the general operations of a job, subject, of course, to the approval of the works manager or superintendent. Tool layout and jigs should be left to the tool room department. With bad planning systems, foremen in some large works are nothing better than glorified clerks, which is very discouraging to men of initiative. What is more important, the firms concerned are ignoring a valuable asset. When a better way is seen, there is no wisdom in performing a job in an inefficient and expensive manner, simply because the man who first planned the work did not see all the possibilities.

## Milling Clearance on Combination Center Drills

By King J. Bogardus

In the small machine shop where a great deal of centering is done, little difficulty is experienced in making a center drill, as far as turning the blank and milling the two grooves is concerned, but when it comes to filing the clearance it is found to be difficult and unprofitable.

The blanks can be turned in any lathe very rapidly by placing a center drill in the chuck or collet and set-

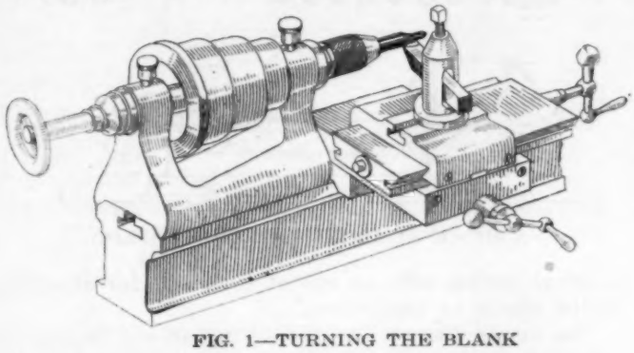


FIG. 1—TURNING THE BLANK

ting the tool in correct position for turning, as illustrated in Fig. 1. The crossfeed will not have to be disturbed, and by moving the handle operating the carriage traverse by hand the angle and diameter can be turned with the same movement. Feeding with the compound rest handle, having the rest set on an angle of 1 deg., instead of feeding with the carriage handle, will make a better blank, due to clearance on the body of the drill.

When the blank is ready for milling the clearance there may be rough-turning marks as the result of not

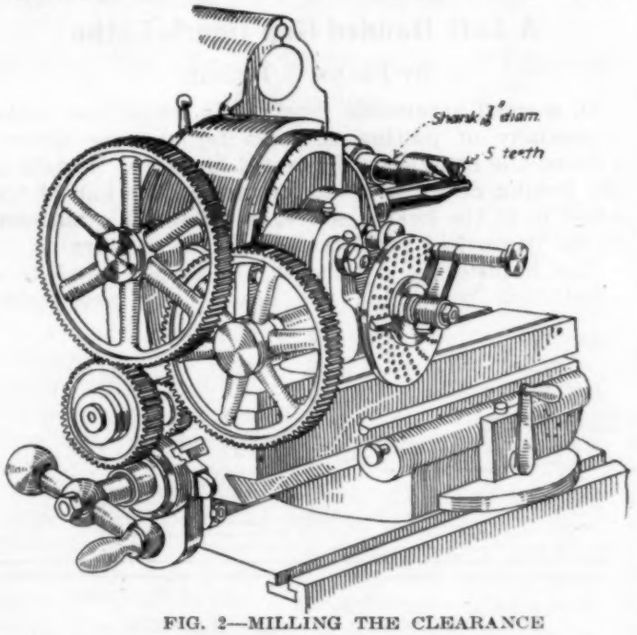



FIG. 2—MILLING THE CLEARANCE

feeding on the angle with the compound rest set at 30 deg., and there may also be a ragged edge on the flutes after milling; but all of these will be removed when the clearance is milled, and the milling will also correct the angle if necessary. The set-up for milling the clearance is shown in Fig. 2.

Holding the cutter in the chuck of the milling machine spindle and the drill blank in the chuck of the dividing head, we are ready to mill this clearance. As most milling machines cannot be geared for milling spirals of shorter than $\frac{8}{8}$ in. lead by gearing to the worm on dividing head, the gear is placed on the spindle of the dividing head which is revolved, feeding the table by turning the handle of the dividing head by hand.

## Improvised Tools in the Oil Country

By Frank C. Hudson

In turning rods for oil pumps, which are about 6 ft. long and perhaps $1\frac{1}{2}$ in. in diameter, the device shown in Fig. 1, has been found very useful. It consists merely of a plate *A* supported by the two substantial arms *B* and *C* bolted to the side of the saddle of the lathe carriage at *D*. The plate *A* carries two cutting tools on the front side, and three guiding rollers on the face shown. This device is in reality an improvised follow rest with roller guides, and has proved very satisfactory for work of this kind.

Another device in connection with oil pump work is shown in Fig. 2. This is an attachment for a vertical drilling machine, used in turning the pump valve cage,

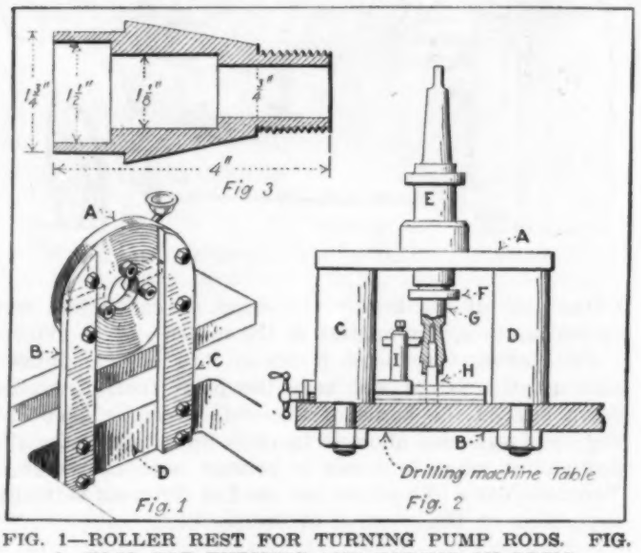



FIG. 1—ROLLER REST FOR TURNING PUMP RODS. FIG. 2—TOOL FOR TURNING AND BORING ON DRILL PRESS. FIG. 3—THE PIECE TURNED

shown in Fig. 3. The device consists primarily of the plate *A*, which is supported on the drilling machine table *B* by means of sleeves *C* and *D* held in position by the through bolts shown. The plate *A* carries the guide *E*, through which a special spindle, driven from the spindle of the drilling machine, works. The spindle carries a collet *F*, in which the stock *G* is held. Bolted in position on the table *B*, is a base carrying the combined drilling and boring tool *H* and also a tool slide with a toolpost *I* for turning the outside of the cage. The toolpost *I* can be adjusted to or from the center, so as to regulate the depth of cut, and also to turn straight or taper, as desired.

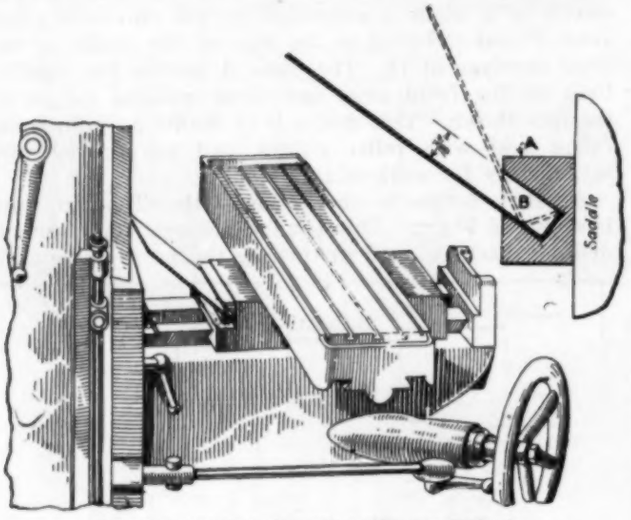
This is simply one of the many devices by which a vertical drilling machine can be used for turning, and was designed only because it was impossible to obtain a suitable turret lathe at the time. It has since been discarded but served its purpose well when it was necessary. These devices are from the shop of the Houston Pump & Supply Co., and were made under the direction of the guiding spirit, Mr. Thomas. The approximate dimensions of the piece turned are shown in Fig. 3.

## Chip Catcher for the Milling Machine

By A. W. Freeman

The device shown in the sketch provides a means for keeping the saddle ways on a milling machine free from grit and shavings, thereby eliminating the cause of a great deal of trouble and wear to the machine.

The holder *A* was made from ½ x ⅝-in. key stock and fastened to the inner side of the saddle, extending over each side of the knee about 2 in. The slot *B*, ⅜ in. wide by ¼ in. deep, was milled its entire length. Three pieces of sheet metal of 20 gage were cut in different widths from 4 to 10 in. and long enough to overhang




CHIP GUARD FOR MILLING MACHINE

either side of the knee. One edge on each piece was turned up to approximately fit the milled slot, as shown.

By placing the metal plates in the holder, flanged side up, the flange will keep the plate from dropping down beyond the angle of the slot, which is about 25 deg., and will also allow it to raise up as shown by the dotted line when it comes in contact with the column. The different width plates are used at different settings, depending on the position of the saddle.

## Re-Echoes from the Oil Country —Discussion

By J. T. Towlson

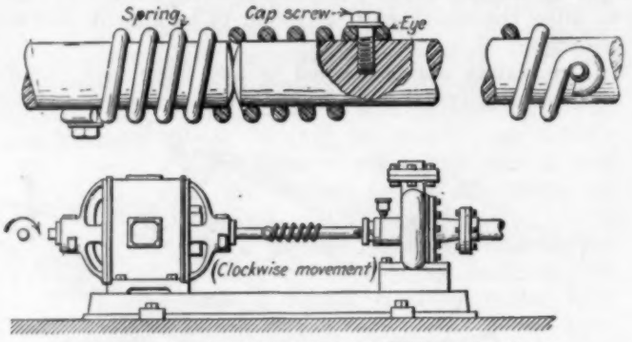
In an article under the above title by E. W. Tate, and published on page 963, Vol. 56 of *American Machinist*, Mr. Tate refers to the way an inside thread was cut on the end of a 40-ft. drill shank on a lathe with a 24-ft. bed. It was a great performance and showed what could be done when necessity demanded.

I have cut threads on bridge suspension-rods 40 ft. long in a lathe having a 16-ft. bed. The work was 4 in. in diameter and the threads were 2 per in. The length of the threaded part was 24 in. It was permitted to waste 1 in. of the rod, and three-quarters of this inch was used for chucking. The work was run in two steadyrests, one on the lathe bed and the other on blocking further along. The thread was started at the required position on the rod and, being right-hand, was cut toward the chuck. After the threading was finished, the rod was cut off at the chuck end, using a ¼-in. parting tool.

## A Shock Absorbing Spring Coupling

By Joe V. Romig

When a motor is direct connected to a machine the armature shaft of the motor and the drive shaft of the machine should be connected by a flexible coupling to allow for any deviation in alignment. The accompanying illustration shows a flexible coupling which is merely




A SHOCK ABSORPING SPRING COUPLING

a spiral spring with an eye at each end for attaching to the shafts by cap screws.

The inside diameter of the spring should be slightly larger than the diameter of the shafts to absorb the starting shock. In applying the spring it should be stretched so as to be under tension when fastened in place and thus keep the abutting ends of the shafts together. Care should be taken to have the eyes on opposite sides of the spring and to have the ends of the shafts slightly rounded.

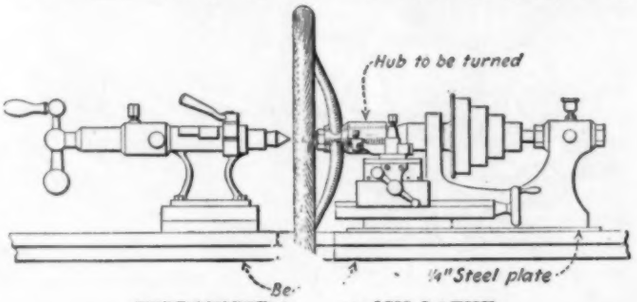
In addition to its ease of application and its smooth running qualities, this type of coupling is the cheapest that can be applied.

## A Left Handed Gap Bench-Lathe

By Frank C. Hudson

In a small automobile repair shop where they make a specialty of putting on locks for steering wheels, I found the little lathe illustrated herewith. Installing the locking device necessitates turning the hub of the wheel to fit the locking sleeve, so the wheel is mounted in the improvised gap lathe shown, for the turning.

The headstock and tailstock are simply bolted to a substantial bench, the two heads being presumably



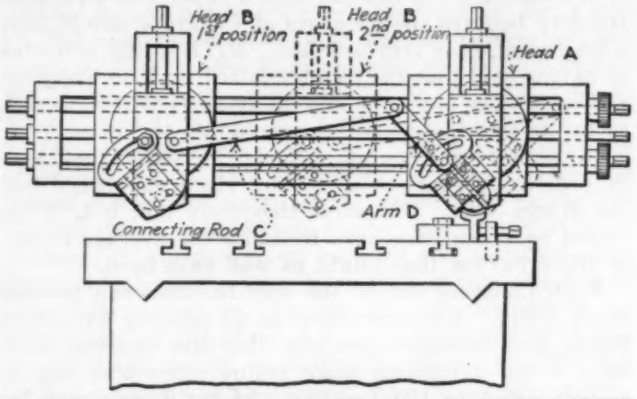

IMPROVISED [illegible] BENCH LATHE

somewhere nearly in line. A gap is cut in the bench so as to allow large steering wheels to swing, as shown. The headstock has a ¾-in. steel plate between it and the bench and on this plate the small slide rest is mounted, as shown. The slide rest carries the tool for turning the wheel hub. It will be noted that the headstock is on the right.

## Generating a Radius on a Planer

BY LOUIS HORNBUGER

We received a job the other day, 12 ft. long and 2½ in. wide, to be machined with a 1¾-in. radius. The specifications called for accuracy and high class finish. Due to the length of the work, it was impossible to mill it except by making several settings which would not be good practice. The next thought was to do the work on the planer which we rigged up as shown in the illustration. Having an extra tool slide which had been discarded we milled it to clear the work and mounted it on head *A*.




HOW THE PLANER WAS RIGGED TO PLANE THE RADIUS

After making connecting rod *C* and arm *D* and attaching them, as shown in the sketch, to heads *A* and *B*, the head *A* was tightened on the rail central with the work. By means of power feed, head *B* was traversed from first position to second position and this moved the clapper block on head *A* through an arc, completing the operation and making a first class job.

## Catching the Thread by the "Jump" Method —Discussion

BY J. T. TOWLSON

London, England

In an article under the above title by B. A. Donley, published on page 970, Vol. 56 of *American Machinist*, Mr. Donley boosts the jumping method, whereas the writer, if he caught one of his men or boys acquiring such a disreputable practice when correct means were easily available, would himself do the jumping by way of having no further use for "the jumpers" services. Threads of both fine and coarse pitches have been cut for generations and in hundreds of shops without reverse belts, without dials and without "jumping" the thread.

There is no need of going to railroad shops hundred of miles from anywhere to discover an absence of dials and reverse belts, for ninety shops out of a hundred in England possess them not. The fact is that such helps to the amateur were a war measure and an assistance to the war mechanics who escaped service by working on munitions, though they had never worked in a machine shop before. Bona fide lathe hands do not need these helps, neither do they stoop to the "jumping" method. They just run the lathe and, after taking the first cut on the thread, they put a chalk mark on the face plate and another on the gear on the lead screw and then run the carriage back to a fixed position.

By always stopping the carriage at the same place on the return, and revolving the spindle until the chalk marks on the faceplate and gear are in the same relative positions as when made, the tool will be in the proper location, the half nut can be closed on the lead screw and the cutting of the thread proceeded with. The value of the reverse belt, as applied to particular cases, is by no means belittled by what has been stated above. There are some jobs such as cutting worms for wheels of diametral pitch when neither the chalking or "jumping" methods are practical. Such pitches are either multiples or fractions of 3.1416 and pitches that are sub-multiples of this dimension are rather fine fractions.

These threads *can* be cut by the chalking method but there is a risk and a waste of time in bringing the marks to their relative positions. Obliged to cut many hundreds of worms having diametral pitches of 4, 5 and 6, I made lead screws of 6 diametral pitch for two of our lathes. With such screws I was able to cut multiples or fractions of 3.1416 with the ordinary change gears and by the chalking method.

## Blue Printing from Typewritten Sheets— Discussion

BY CHESTER G. SALMON

In an article under the above title by H. Broome, published on page 271 of *American Machinist*, Vol. 57, Mr. Broome lays great stress on the importance of using a special ribbon for the purpose of writing on the copy for making plue-prints. We have in our factory about 35 data and part number books which are continually being revised and additions made, new prints being issued accordingly. The data sheets being mostly drawings were, of course, on tracing cloth but the part number sheets were quite a problem as we didn't care to print the part numbers on tracing cloth by hand. It would take up too much space and would almost require the services of one man changing the sheets and making additions, so we tried the tracing cloth in the typewriter, but with little success. Then we tried some Japanese tissue paper put out by the Remington Typewriter Co., with and without a carbon reversed. We found that the tissue with the carbon reversed, worked fairly well but we were not satisfied with it. It had to be run too slowly through the blue-print machine to get the best results.

We have some prepared oil that is sold by the Eugene F. Dietzgen Co., called "Transperento" which we use on van dykes, etc. to lighten their density. We tried this oil on the tissue paper after typing, got the very best results from it, and have been well satisfied with our success. We put the oil on the paper with a brush and then wipe off the surplus with a cloth. allowing the oil to dry before printing, and find that the paper has the greatest possible degree of permanent transparency.

Summing up, nothing out of the commonplace is needed except the oil and that can easily be obtained from almost any dealer of drafting supplies. In case only a few blue-prints need to be made from the original, gasoline or benzine can be used, but they evaporate quickly from the paper and leave it in the same condition as before. The oil can be used on heavier grades of paper but not with the best results. Sketches can be made on paper and then oiled and good blue-prints obtained. It would be advisable to use ink or a very soft pencil in making sketches.

# Editorial

## Charity Begins at Home—or Should

It would seem that a concern doing weaving should consider that weaving equipment has first call on whatever money is to be expended for improvements. Similarly, one engaged in spinning should make its investments primarily in spinning machinery and equipment, and not for a new and improved coal handling device. Again, a concern which manufactures its products with the help of machine tools, should give these machines first claim on investments.

Strange as it may seem, this is not the case in a great many, perhaps, the majority, of instances. The old lathe is still good enough, much too good to be replaced so long as it is in production, and, of course, it stays in production so long as its holds together or can be made to hold together by patching and repairing. The company cannot afford, just now, to spend $3,000 to replace a tool which is still active.

And yet, this same company is spending $50,000 on a new power plant because it is a good investment. It will borrow the money, if necessary, because a 10 per cent return has been promised.

This picture is not overdrawn. The cause of this peculiar phenomenon is possibly that the power plant promises a saving of coal, something tangible, whereas nobody has the temerity to guarantee a definite return on the investment when improved machine tools are bought. The machine tool builder does guarantee the performance of the machine, but he is not in position to translate the increased output into dollars and cents.

The man who sells the engine for power plant in general can point out that the saving in coal will be 3 tons a day, that this coal costs $6 a ton, and that there are 300 working days a year, so that the total saving will be $5,400 per year. This admits of an investment of $54,000 with a return of 10 per cent. As the outfit he tries to sell calls for $50,000 only, he has a good proposition and is very apt to convince the prospective customer.

Such a simple procedure is not possible when machine tools are sold. There is the operator to be considered, and besides, many different jobs are done on this one machine. Moreover, the real values of these jobs are not accurately known and it is difficult to compute the amount of savings due to the new machine. There are several other reasons, perhaps, and yet, it seems to us that the owner of a machine shop should first look after machine tools and similar equipment, that the owner of a drop forge shop should first consider his hammers, his presses and furnaces, and that, generally speaking, charity should begin at home.

On the other hand, a machine tool machine needs to be but litle more productive to give 10 per cent on the investment. To save $200 a year with a $2,000 machine should be easy. It might even be done though the new machine is in no way different from the old one, just because it is new and requires less attention and repairs and interests the operator, much as a new automobile puts the chauffeur on his best behavior.

## Give Them a Long Vacation

The statement in this morning's paper that President Harding believes the members of Congress should have a long vacation is very welcome. Mr. Harding is quoted as having said that the country is fed up with Congress and its actions and he is absolutely and entirely correct, so far as this Congress is concerned at any rate.

It seems as though the national legislators had been in practically continuous session since our entry into the World War. Of course they have not, but, if the extent to which they have irritated the average citizen is any criterion, they might as well have been.

With Congress out of the way business can proceed more freely. No uncertainty as to pending legislation hangs over business men and they are assured of at least a fair breathing space before more laws can be passed. Bad as the taxation and tariff acts may be, they are at least definite and steps can be taken to meet their requirements.

As usual the majority leader has pointed with pride to the number of bills passed, something over four hundred. If quantity were the only requisite no fault could be found, but when it comes to quality—well, just consider how many obsolete, worthless and unenforceable laws there are on the statute books. One of the obvious defects of our form of government is the ease with which such laws can be passed. Truly we have a "government of laws."

How our problems would be simplified if only a Congress could be assembled to repeal the unnecessary legislation which encumbers the business of living. But what a Herculean task it would be!

## China Trade Bill Becomes a Law

During the past week, the President signed the China Trade Bill. It is now a law after a campaign for its enactment which lasted nearly three years. Unfortunately, with tariff legislation occupying the foreground in national affairs, the purport of the bill and the placing of it upon our statute books has not been accorded the publicity it properly deserves.

In brief, the bill is designed to aid Americans, desirous of engaging in commercial or industrial activity in China, by relieving them of a two-fold tax burden. Under the Hongkong ordinances, British companies, and their personnel operating in China, were exempted from corporate and personal income taxes in Great Britain. American enterprise was thus placed at a distinct disadvantage. Corporate taxes were paid at home and abroad. Upon the personnel sent out from the States was laid a similar burden.

Living in China even under the best conditions is far different from what it is in the States. The cost of housing, food and other necessaries, everywhere in the Far East, is exceedingly high. Conveniences for unmarried men, not to mention those with families, are trying even under the best circumstances. To lighten their burdens and those of their companies should be our first thought.

# Editorial

## What Should We Do About It?

We have before us a copy of the *New York Commercial* in which appears a lecture given by Mr. Floyd W. Parsons, Editor, *Gas Age Record*, before the Advertising Club of New York on Sept. 20. In this lecture Mr. Parsons points out and condemns the fearful waste of materials of which this country is guilty. He goes so far as to say that, just as we are speaking now of the stone age, the bronze age and so on, so will future generations speak of the present era as the age of ivory domes. We have no fault to find up to that point for ivory is a nice, genteel material and quite valuable. But when he said a little later that it was established beyond doubt that we (in common with the rest of the inhabitants of the U. S. A.) were possessed of domes of solid bone, we sat up and took notice. We felt that we had to look a little further into this matter before we could accept the verdict.

The lecturer pointed out how much coal could be saved by using our water power, something which cannot easily be denied. He then went further and showed how we are depleting our reserves of iron ore, how the consumption of iron had increased since the beginning of this century and how it is still increasing. Copper also, Mr. Parsons claims is used at a rate which may exhaust the supply in a few years, while oil is already burned at a rate much beyond the rate at which it is produced in this country and this rate itself must exhaust the visible supply in a generation.

The picture is indeed a sad one. It reminds us of the lamentations of Jeremiah and also of Mark Twain when he said: Everybody complains about the weather, but nobody seems to do anything about it. (We quote from memory).

That's it. What is Mr. Parsons going to do about it, or what does he expect us to do about it? We are willing to obey orders if somebody is willing to give them and assume responsibility.

He does give orders about coal. He says: "Develop our water power," Good, we'll do that, we have already started. Truth compels us to remark at this point that, if we wish to utilize this developed water power, we'll need more copper than ever. Or is there perhaps a way to avoid it? Aluminum? Then we'll begin to exhaust that material. Oil is used almost entirely where water power can do no good, for automobiles, trucks, steamers, so that it seems as if the most promising way to save oil is not to use it. This method also goes for iron. There is at present no material which can take its place. But how can we live the life we wish to live without iron?

The trouble with articles and lectures such as Mr. Parsons' is that they are merely complaints. They are not constructive, they do not help. Of course we can cut down the consumption of anything by lowering our standard of living. We can even go back to the single stove in the home and perhaps family relations might be improved if all the members were sitting around it each night. We might become sturdier and hardier if all other rooms in the house were left cold. Maybe.

Candles made from the tallow of home butchered sheep may make electric light and its copper and even kerosene unnecessary. And, as we have butchered our own meat, the butcher does not need a delivery truck, which saves more oil. Also we do not need to call him up by telephone, which saves more copper.

Oh yes, we could, but would we?

## The End of the Bonus

President Harding has justified the country's faith in his sound judgment by his veto of the so-called adjusted compensation bill, passed by Congress. At the same time, Congress has, by its action, added one more point to its score of mistakes. There seems little reason for doubt that most members of both Senate and House, who voted for the bill, did so with an eye to the votes to be gained by so doing. It is our feeling, however, that they were mistaken in their estimate of public sentiment and we have evidence to support our view in what happened at the primaries to some of the strongest advocates of bonus legislation.

Commendation is also due those Senators who sustained the President's veto. Perhaps they should be praised as much for their political acumen as for their support of an executive action which is undoubtedly for the good of the country. At any rate, they did a good job and American business men will breathe more freely as a result of the laying of the bonus specter.

Aside from the merits of the case as to whether or not ex-service men should receive a bonus, the bill, which has just been disposed of, was faulty in that it failed to provide means for securing the funds needed to carry out its provisions. It deserved its fate.

## Just Suppose

Just suppose a big strong man, a giant of a fellow, were the employer of a number of men and wanted these men to turn out more work per hour and work more hours per week. Suppose that the men being unwilling, he fired them all and said to them:

"You are suspended until you make up your minds to work for me on my conditions, but don't you dare to go to another shop. If you do, I'll do everything in my power to break you and bring you to poverty. You have your job just as before, but I won't let you work at it and I won't pay you for it."

Now suppose some of the men, having no sense of honor, fairness, or decency go to the big man's neighbor, ask for and obtain a job and the big man, hearing this, knocks some of his neighbors down, kills one of them and burns the factory of another. Don't you think he is perfectly right and that no court should stop him with a fool injunction?

Nonsense, such things may be done by strikers but not by—

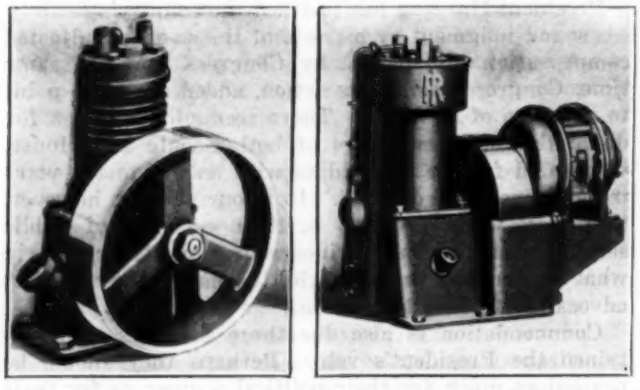
Well, but

Just suppose.

# Shop Equipment News

## Ingersoll-Rand Small Vertical Air Compressors

A line of small vertical air compressors known as Type 15 has recently been brought out by the Ingersoll-Rand Co., 11 Broadway, New York, N. Y. At the left of the accompanying illustration the plain belt-driven machine is shown, and at the right the self-contained electric-motor-driven outfit. The machine is built in four sizes in either style. With the motor drive, the compressor may be driven by means of a pinion and



INGERSOLL-RAND VERTICAL AIR COMPRESSORS

internal gears, or by a short belt. Both motor and compressor are mounted on a common sub-base, so that they are not dependent upon the foundations for correct alignment.

The principal features of the construction lie in the constant-level lubrication system, the constant-speed unloader for the belt-driven machine, and the centrifugal unloader for controlling the starting and stopping. The base of the compressor forms an oil reservoir. Above this reservoir and directly underneath the connecting rod is a constant-level pan to which a small pump forces oil from the reservoir. If the amount of oil in the reservoir, is kept between the high- and the low-level pet cocks that are provided, the system will continue to function and keep the oil at a constant level in the pan. A projecting stem on the connecting rod dips into the pan and distributes the oil to the bearings.

When the receiver pressure rises above that at which the unloader is set to operate, the constant-speed unloader automatically opens the inlet valve, so that no more air is delivered. When the receiver pressure has fallen to a predetermined amount, the unloader automatically releases the inlet valve and allows the compressor to again return to work.

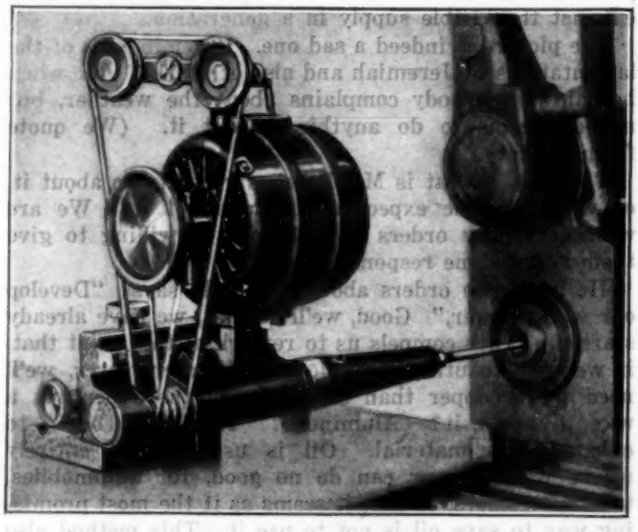
The centrifugal unloader permits the compressor to start under "no load," as is essential when automatic start-and-stop control is used, and it allows the driving motor to come up to full speed before the load is thrown on. This unloader operates by holding the inlet valve open until the motor has reached full speed.

The smallest size of the machine is built with either a ribbed cylinder for air cooling, as shown at the left of the illustration, for use where the service is intermittent, or with a water-jacketed cylinder of the reservoir type for constant service. All other sizes are built with the water jacket, as shown at the right. The reservoir pots are of large size and capacity.

## "Precision" Extension Spindle and Housing for Thread Grinder

An attachment consisting of an extension housing and an extension spindle for all models of its multi-graduated thread grinder, such as described on page 160, Vol. 52 of *American Machinist*, has recently been placed on the market by the Precision & Thread Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa. The device is applicable to deep internal grinding and can grind to a depth of 12 in. on holes 2 in. or greater in diameter, and to a depth of 6 in. on holes ½ in. in diameter.

The device has a number of uses, and can be mounted on machines of different types. It is shown in the illustration herewith mounted for grinding the tapered bore of a milling machine spindle. Such an operation can be quickly performed, so as to give perfect concentricity to the bore after it has become scored or worn. The tapers of lathe spindles can be ground in the same manner, with the grinder mounted on the



EXTENSION SPINDLE ON "PRECISION" GRINDER

toolpost. Besides grinding deep holes in jigs, fixtures and other work, holes that are difficult of access because of projecting obstructions can be reached.

The extension housing is screwed directly on the threads at the front of the spindle cap of the grinder. The extension spindle couples on the end of the regular spindle by means of a tapered joint. It is supported by double radial and end-thrust ball bearings at the extreme outer end of the housing. The mounting is stated to give rigidity at the wheel end of the spindle.

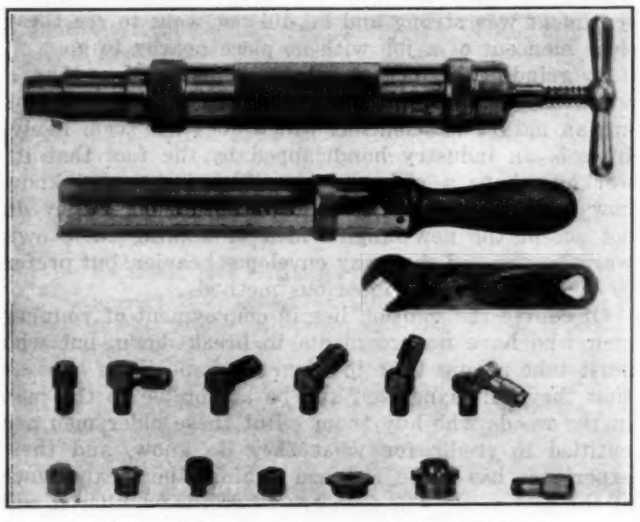
## "Dot" High-Pressure Hand-Operated Bearing Lubricator

A device for forcing oil or grease into bearings has recently been placed on the market under the name of the "Dot" lubricator by the Carr Fastener Co., Boston 39, Mass. The lubricator, which is hand operated, is adapted to use on all sorts of machinery where shafts or bearing surfaces require lubrication, such as cranes, stokers, conveying machinery, machine tools and automobiles.

Nipples are applied to the bearing boxes in the position where the oil hole or the oil cup is normally placed. Each nipple is provided with a spring loaded ball in the top that automatically closes the opening except when pressure is applied on it. Thus the hole is normally closed to prevent both the escape of oil from the bearings and the entrance of dirt. The nipples can be furnished to face at all angles, so that they can be easily reached by the lubricator itself. At the bottom of the accompanying illustration are shown a number of styles of nipples. A small dust cap is placed over each nipple, but can be readily removed for oiling. Extensions can be furnished in any length required. Reducing bushings and couplings, also shown, can be supplied in the desired sizes.

The lubricator proper consists of a pump which is fitted with a plunger for ejecting the oil from the forward end. This plunger is screw operated by turning the handle at the rear. The nozzle is an integral part of the device, so that no flexible coupling is necessary. The inside of the nozzle has a special triangular shape to fit the nipples. It is applied to the nipple, and the handle given a slight turn to the right, so that the nozzle locks to the nipple.

With further turning the valve in the lubricator



"DOT" LUBRICATOR AND FITTINGS

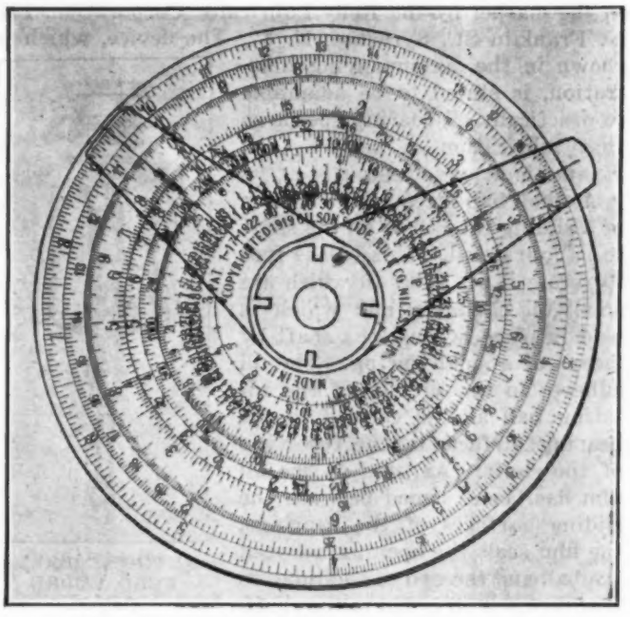
opens and the oil or grease is forced under high pressure into the nipple and to the bearing surfaces. A quarter turn of the handle to the left releases the nozzle from the nipple. No further turning back of the handle is necessary to prevent the escape of lubricant from the lubricator, as the valve automatically shuts off the passage.

Since such a high pressure can be obtained by the use of the device, either oil or grease may be forced into the bearings. If desired, kerosene may be employed before putting in the oil, thus washing off the surfaces. For use with grease, the filler shown in the illustration is furnished. The principal feature in the operation of the device is the fact that it can be used with one hand only, so that places difficult of access can be reached. The operator can thus lubricate bearings very rapidly.

## Gilson "Midget" Circular Slide Rule

A circular calculator has just been placed on the market by the Gilson Slide Rule Co., Niles, Mich., under the name of the "Midget" slide rule. This instrument has all of the scales of the regular slide rule and several additional features which make it especially useful in the shop and drafting room.

There are nine engine-divided scales on the front side of the instrument and two celluloid indicators with hair lines for close reading. The long indicator always gives the answer to the problem that is being solved.



GILSON "MIDGET" CIRCULAR SLIDE RULE

On the back side are scales for giving sines, tangents, cosines and cotangents of all angles from 0 to 360 deg., and the decimal equivalents of fractions to six places.

The binary scale is divided into 64ths, 32nds, 16ths, etc., so that fractions and mixed numbers can be multiplied and divided without changing them to decimals. There is a scale divided into equal parts for reading to 0.001 in., concentric with a scale divided into 64ths, so that fractions and decimals may be added and subtracted and the result can be read as a decimal or to the nearest 64th.

Concentric with these two scales are the thread and drill size scales. The sizes of all drills from 60 to 1 and from A to Z are given in thousandths and to the nearest 64th of an inch. The thread scale gives the size of drill to use with any size tap having any V or U.S.S. thread from 3 to 50 per in. The size of the drill may be read as a fraction, a decimal, or a numbered or lettered drill.

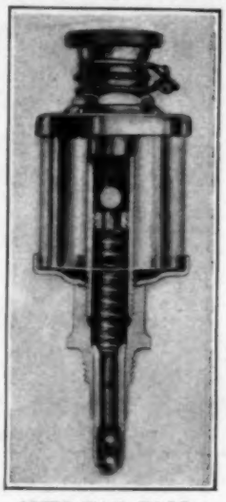
As the rule is 4 in. in diameter, the outer or C scale is about 12 in. long. This scale is for the ordinary operations of multiplication and division. The A scale gives square roots and the corresponding powers. There is a log-log scale which is a spiral and is graduated between 1.15 and 1,000,000. This scale gives every

possible root and power of any quantity. It also gives the natural logarithms (base e) of all numbers between 1.15 and 1,000,000. Another scale gives the common logarithm (base 10) of all numbers. There is a graduation at 0.3937 in. marked "c" which is equal to 1 cm., and other useful graduations as 3.1416 and 0.7854 are indicated.

With the exceptions of the log-log, thread and drill scales, all of the graduations are on circles. It is therefore impossible for the answer of a problem to fall off the end of the scale, as often happens when a straight slide rule is used. The graduations are on white celluloid mounted on aluminum, and are waterproof.

## Auto-Vac Ball-Feed Bearing Lubricator

A lubricator for machine bearings designated as the "auto-vac" ball-feed lubricator has recently been placed on the market by the Kelly Lubricator Corporation, 107 N. Franklin St., Syracuse, N. Y. The device, which is shown in the accompanying illustration, is stated to be adaptable to practically all bearing speeds so that lubrication is positive and automatic at any speed.



AUTO-VAC BALL-FEED LUBRICATOR

A small ball fitted at the bottom of a sliding tube rests on the shaft to be lubricated. This ball is free to rotate in its tube, in which are small oil channels, and which is held in place against the shaft by means of a small spring. The oil adheres to the surface of the rotating ball and is carried to the bearing surfaces by the revolving of the shaft. As soon as the oil film has been formed between the sliding surfaces of the bearings, the film seals the opening between the ball and the end of the tube, so that no more oil is fed to the shaft. It is stated that more oil does not leave the cup until this film has become broken. Since oil is fed only when it is needed on the bearings and not when the machine is at rest, a considerable saving is stated to be possible. The positive lubrication is of value particularly on bearings using high speed, such as on blowers and grinders, as the shaft is always kept lubricated. After the lubricator has once been adjusted, no further adjustment or setting is necessary when starting or stopping the machine.

The oil cup has a large opening at the top for filling it. The glass body is held in place by a brass top and bottom fitted with gaskets. The base of the cup has standard pipe threads and the stems are made in various lengths to suit the thickness of bearing cap to which the lubricator is fitted. The lubricator is made in four sizes having capacities of ¼, ½, 1 and 2 ounces.

## Grinding Off Stock

BY ENTROPY

The other day I dropped into a shop where they make among other things some good sized axes. The axes are, of course, first forged and then ground to get their shape, then hardened, tempered and ground to sharpen them. In the room where they were doing the first grinding I looked at the wheels and the work and watched the men. It looked as though they were working unnecessarily hard and as though it was taking more power to do the job than it should, and that they might do the work faster, and do less work and use less power if they used a softer wheel. I asked the superintendent, who was going through with me, if they had ever tried using a softer wheel. He said that they had, that he thought the softer wheel was the right thing, but that their shop was "different" and that it did not pay.

Further inquiry brought out this state of affairs. The men are piece workers, they have many of them been in that kind of work for years, back to the time when such work was all done on natural grindtsones, and when it was considered that an emery wheel would ruin the work if used. They were used to bearing on very hard. When the soft wheels were tried the men bore on just as hard as ever, with the result that they overheated both work and wheel. They ran up their earnings very fast, but they had a great number of mishaps due to bursting wheels, which could only be laid to the overheating of the wheel. Consequently, the management went back to their standard grade, and the accidents ceased and everybody was satisfied, except the firm that did not make as much money and the workmen whose earnings went back to their old rates.

### DIFFICULTY OF TRAINING THE WORKERS

The superintendent found it impossible to educate these older men to bear on somewhat less, and to be satisfied with something less than the maximum rate of pay which they might have made. He had thought of letting out all the old hands and training up a new crop of men to take their places who would not have any oldtime experience to unlearn, and who would be willing to learn the way the shop thought best, but sentiment was strong and he did not want to see these older men out of a job with no place nearby to go.

So grinding becomes a labor problem rather than a scientific one, unless it can be said that sizing up of human nature is scientific, which does not seem likely. Here is an industry handicapped by the fact that its workmen have a rich and long experience, and know how in their own minds to do a given job. They do not accept the new-fangled idea of making their own work lighter and their pay envelopes heavier, but prefer to continue their old laborious methods.

Of course the solution lies in employment of younger men who have no precedents to break down, but who must take a long time to learn to shape these axes so that they will hang well and be acceptable to the men in the woods who buy them. But these older men are entitled to credit for what they do know, and their experience has to be weighed against the inexperience of the new men. The firm has to decide whether it will uninterruptedly turn out axes acceptable to the men in the woods and let the cost run high, or whether they will cut down the cost by employing men who cannot get the correct shape every time and whose product is less expensive but also less saleable.

In this instance the cost of sales is considerable, for these axes cannot be sold direct from the shop to the consumer but must be distributed to every hardware store and every general country store on the continent and then to some more continents. Here the cost of selling something that did not just exactly suit a customer of whom the factory knew nothing outweighed a very substantial reduction in the cost of manufacture.

# News Section

## National Airplane Races Will Draw Big Crowd to Detroit

Widespread interest is being centered in the National Airplane Races which will be held at Selfridge Field, Mt. Clemens, Detroit, October 7, 12, 13 and 14. The races will be conducted by the Detroit Aviation Society, and are sanctioned by the Aero Club of America.

The official program of the races which has just been issued, schedules the following events:

Event 1. October 7, Detroit Aerial Water Derby, including the Curtiss Marine Flying Trophy. This will be a free-for-all race for flying boats and seaplanes. First prize, $1,200; second, $600; third, $200, and award of Curtiss Trophy to winner. Distance 160 miles.

Event 2. October 12, Detroit News Aerial Mail Trophy. This will be a race for large-capacity multi-motored airplanes. Cash prizes, the same as in Event 1, and award of trophy to the winner. Distance 240 miles.

Event 3. October 12, Aviation Country Club of Detroit Trophy. This will be a race for light commercial airplanes. Cash prizes, the same as in Event 1, and trophy to the winner. Distance 240 miles.

Event 4. October 13, Liberty Engine Builders' Trophy. This will be a race for observation type (2 passenger) airplanes. Cash prizes, the same as in Event 1, and trophy to the winner. Distance 240 miles.

Event 5. October 14, Pulitzer Trophy, free-for-all race for high-speed airplanes. This race promises extraordinary features because of the new types of high speed craft which are entered. Cash prizes, the same as in Event 1, and award of Pulitzer Trophy to the winner. Distance 160 miles.

## Power Exposition Will Draw From All Industries

Engineers well known in industrial and public utility power generations make up the advisory committee which is guiding the National Exposition of Power and Mechanical Engineering. This exposition will open at the Grand Central Palace, New York City, on Dec. 7 at noon and will extend through to Dec. 13 (except the intervening Sunday). It will immediately follow the annual meetings of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers. Irving E. Moultrop of the Edison Electric Illuminating Co., Boston, heads the advisory committee, and his colleagues are: Dexter S. Kimball, president the American Society of Mechanical Engineers; Alexander G. Christie, chairman, power division, A. S. M. E.; Fred Felderman, national president, National Association of Stationary Engineers; Milan R. Bump, president, National Electric Light Association; N. A. Carle, vice president, Public Service Production Co. of New Jersey; E. B. Katte, chief engineer, Electric Traction, N.Y.C. R.R. Co.; Fred R. Low, Editor *Power;* David Moffat Myers, consulting engineer; Calvin W. Rice, secretary, A. S. M. E., and the managers, Charles F. Roth and Fred W. Payne.

The list of firms who have already reserved space shows that all apparatus and materials used in harnessing the energy released from fuels will be represented.

All members of the American Society of Mechanical Engineers who attend the meeting will receive the half fare return certificate which will enable them to attend the exposition.

## Italy as a Market for American Machinery

It would doubtless pay American manufacturers to watch the Italian market, says a correspondent writing from Switzerland. While during the last few months German, English and Swiss sales agents are to be found in almost every large city seldom is an American salesman met in Italy. And yet there are many opportunities for American machinery manufacturers. American-made machines are in high favor in that country and a special opportunity is being offered by the extension of most of the Italian seaports.

The Italian Parliament has just passed a law according to which no less than 1,500 million lire will be appropriated for the extension and reconstruction of some of the foremost Italian ports. The harbor of Genoa will receive 144 million lire for this purpose, Venice 85 million lire, Bari the same amount, Savona and Cotrona receive 84 million lire each, Palermo on the island of Sicily, 66 million lire, Naples 50 million lire. Ostia, the port of Rome, is to receive 47 million lire, Messina and Spezia 40 million lire each and Catania, 36 million lire.

The rest of the amount will be spent for reconstruction and extension work on the ports of Leghorn, Oneglia, Ancona, Riposto, Corsini, Ortona, Civita-Vecchia, and Rimini. Manufacturers of dredging and excavating machinery, pumps, etc., should pay special attention to the possibilities offered in Italy during the next few years.

## Cost Accountants Elect Officers

The National Association of Cost Accountants in convention last week in Atlantic City elected J. P. Jordan, industrial engineer of New York, as president; C. M. Finney, of New York, first vice president; S. L. Whitestone, Schenectady, second vice president, and Harold Dudley Greeley, of New York, as treasurer. The secretary is named by the executive board.

C. R. Stevenson and W. S. Gee, of New York, were elected directors for three years and William M. Lybrand and H. B. Fernald, New York, for one year.

## American Bankers Association Convention

Plans for one of the greatest financial congresses in the history of the nation are contemplated in the arrangements for this year's convention in New York City of the American Bankers Association, falling as it does at a particularly formative time in the new era of world business, it is declared in a preliminary announcement of the program issued by the association during the past week.

The convention, which is the forty-eighth annual meeting of the association, will be held at the Hotel Commodore, New York City, Oct. 3, 4 and 5.

The Right Honorable Reginald McKenna, formerly Chancellor of the British Exchequer and now chairman of the London Joint City and Midland Bank, will discuss 'Reparations and International Debts.' Thomas W. Lamont of J. P. Morgan & Co. will treat world finance from the American viewpoint. Henry J. Allen, the fearless, aggressive Governor of Kansas, will discuss the responsibility of the government for industrial justice and the relation of the Federal Reserve System to American business.

## Gear Manufacturers to Hold Semi-Annual Meeting

The American Gear Manufacturers Association will hold its semi-annual meeting at the Drake Hotel, Chicago, Ill., October 9, 10 and 11. An impressive program has been outlined which in addition to reports of committees and routine business, will include a number of interesting addresses. Among these will be "The Evolution of the Gear" by George L. Markland, Jr., president of the Philadelphia Gear Works; "Apprenticeship" by P. C. Molter, superintendent, Department of Industrial Education, The National Metal Trades Association; "What the Association Needs from Committee Men, After Nearly Six Years Secretarial Observation" by Frank D. Hamlin, vice president, The Earl Gear and Machine Co.; "Why Buy a Pig in a Poke" by L. G. Hewins, sales manager, The Von Dorn & Dutton Co.; "Sandardization of Gear Sounds" by Prof. Daniel L. Rich, University of Michigan; "Engineering Research" by Prof. A. E. White, Department of Engineering Research, University of Michigan, and others.

The regular informal banquet will be held on Tuesday October 10. John B. Foote, president of Foote Bros., Gear and Machine Co., Chicago, who is one of the older members of the association will be toastmaster. The speakers on this occasion will be the Hon. Marcus Kavanagh, Judge of the Superior Court of Cook County, Illinois who has announced as his subject "Business Man and Law Enforcements"; and General John V. Clinnin who will speak on "Effect of the Late War of the World."

# The Business Barometer

## This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE

Editor, *Commerce and Finance*, New York

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AT MY request checks for comparatively large amounts on 14 of the more important New York banks and trust companies were cashed last week. "20's" and "50's" were asked for but the currency in which payment was desired was not otherwise specified. Against these checks the payees received an average of about 60 per cent in gold certificates or "yellow backs."

These "yellow backs" as is generally known, are receipts certifying that the equivalent in gold has been deposited with the United States Treasury and is payable to the bearer on demand. I arranged to have the checks cashed to ascertain whether there was any basis for the report that the banks were making an effort to get gold into circulation. The result seems to indicate that such an effort is being made.

As to its purpose opinions differ, but it is plain that if a substantial portion of the gold now impounded in the Federal Reserve Banks is put into circulation a reduction in the reserves, the reserve ratio and the lending power of the banks will follow. As the gold held by the Federal Reserve Banks gained $15,000,000 last week and the reserve ratio stands at 78.4 per cent the distribution of a few millions of gold does not make much difference just now, but the fact that the gold which was so jealously accumulated two years ago is now being paid out unasked for seems to suggest that the banks realize that its retention where it can be seen might incite inflation and that they are doing what they can in a quiet way to get it out of sight.

Incidentally it may be observed that if we ceased to import gold and the banks succeeded in forcing any considerable amount of their holdings into circulation the resulting reduction in reserves would be reflected in higher interest rates and a decline in the price of bonds and those dividend paying securities that fluctuate in inverse relation to the money market.

Coming events sometimes cast their shadows before and it may be that the decline in Liberty Bonds and other high class obligations is due to the selling of some long headed financiers who foresee "tighter money" sooner than is generally expected. Meantime all the Liberty 4¼ per cent issues are again below par and the enormous transactions recorded during the week indicate that some very large holdings have been disposed of.

These considerations and the expectation that Secretary Mellon will shortly undertake some very important refunding operations that will temporarily tie up much capital lead me to feel that for the present at least any further advance in the security market is unlikely.

Special stocks may be put up for special reasons but commercial loans are gradually increasing and bankers probably foresee a further demand for money from merchants that would make it difficult to finance a concurrent boom in stocks.

As to our domestic trade in merchandise all the indicia continue favorable. Some hesitancy has, however, been induced by the apparent truculence of Kemal and the fear that he may compel Great Britain to resort to force or attract the support of the Russian Soviet army. The news from Constantinople and Asia Minor may, in fact, be interpreted according to taste. No one really understands its import or can foresee the future. Most thoughtful Americans are disposed to be cautiously confident of peac although we are so isolated that the outcome will not make much difference to us in a material way except as it may affect Europe's ability to buy of us and our export trade.

> **Although confident of peace, thoughtful Americans are looking upon the situation in the Near East with caution. While our trade on this side of the Atlantic and with the Orient may not be greatly affected, an outbreak of hostilities would, without doubt, disturb seriously our commerce with Europe.**

But when we consider our own tariff bill and the impoverishment of Europe it becomes a question of whether we can expect much transatlantic export trade in any event. Three of the largest American life insurance companies have announced their withdrawal from all Europe except England and our financial and commercial relationships with the territory thus abandoned are likely to become more and more tenuous pending the re-establishment of fiscal and political order.

This is why I doubt whether business in the United States would be much shocked by an actual outbreak of hostilities abroad. From the standpoint of the humanitarian such a contingency is horrible to contemplate but it would not much effect our trade on this side the Atlantic or with China and Japan.

The decline in sterling exchange, which is selling at 4.36 as I write, is, however, about the only item in the week's financial news that can be interpreted as distinctly unfavorable. Marks are a shade lower but what else could be expected with an increase of 19 billions in the quantity outstanding, which is now about 290 billions.

Considered in detail the commodity markets have acted normally. Wheat advanced when the dogs of war came nearer and declined as they retired. But upon the whole the wheat market seems to be intrinsically stronger. Cotton reversed the action of wheat as it always does when war threatens, but with the South selling about 50,000 bales a day at an average of $100 per bale and thereby strengthening its cash position at the rate of 30 million dollars a week an advance was hardly to have been expected. After a few weeks of this the cotton planters will be able to hold the rest of the crop comfortably and this is what they threaten. Meantime the American spinners seem wisely disposed to buy freely as the market approaches 20 cents, below which it is unlikely to go at present.

Wool is firm both here and abroad. So is silk, burlaps, jute and paper. The demand for all grades of the latter article is said to be in excess of the supply. Rubber is sharply higher in the London market and sugar is slowly creeping up as the strength of the position becomes better understood. A further advance on both rubber and sugar seems to be clearly indicated. Hides, leather and the shoe trade comprise another group of which increased activity at better prices is reported. Glass, lath, flooring and most building material except brick are also higher. Steel continues firm with the railroads large buyers at higher prices. Copper is static at 14 cents although the demand is large.

The trade in woolen, silk and cotton textiles is good, but there is a scarcity of staple cotton goods and some of the New England manufacturers are demanding higher prices.

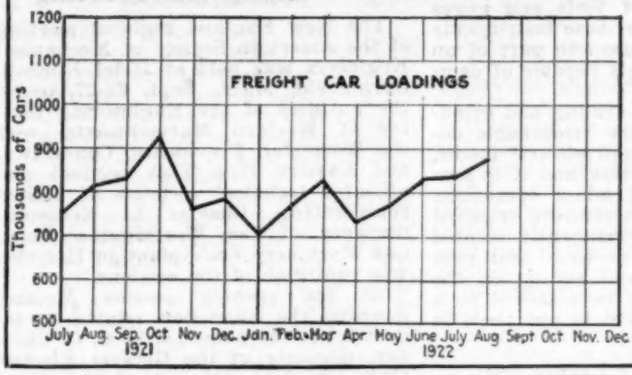
On the whole the feeling seems to grow more and more cheerful the farther one gets from the Stock Exchange and this cheerfulness of feeling was especially noticeable in Dayton, Detroit and Cleveland, to which cities I paid a hurried visit last week. Nearly everyone in the Middle West seems hopeful and Henry Ford's popularity has been greatly increased by the decline in bituminous coal which is justly or unjustly ascribed to his boldness in fighting the coal profiteers.

The fact is that coal for which $9 was asked three weeks ago can now be bought at $5. I don't know who is responsible for the drop but everybody except the coal dealer is now singing "Praise Ford from whom all blessings flow."

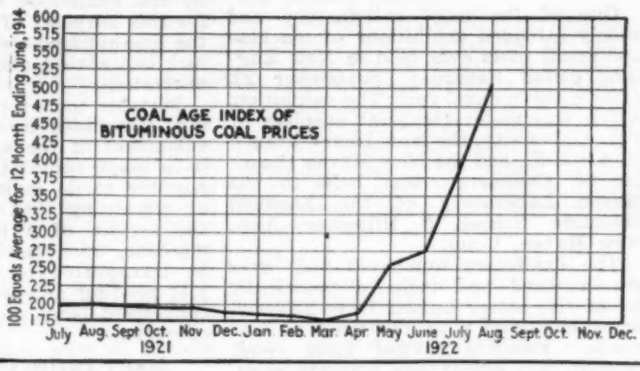
The railroads are doing an enormous business. There is now a shortage instead of a surplus of cars and loadings during the week ending Sept. 16 totalled 945,919 cars.

There is every prospect of an acute freight blockade later in the season but this is generally an incident of good times, and prohibitive rates for money is about the only thing that will check the expansion that appears to be in prospect.

**Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.**




**Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.**




**LOADINGS of revenue freight** on American railroads during August averaged 887,000 cars a week. During the first half of the month weekly loadings remained nearly stationary as compared with the July period. The movement of coal and grain in the latter part of the month, advanced loadings sharply from 856,219 cars on August 19 to 890,838 cars on August 26. Since that time the weekly advance has continued rapidly, the week ending September 16 witnessing a total of 945,919 cars loaded.

**Automobile production** during August, with 246,941 passenger cars and 24,064 trucks, recovered some of the ground lost during July. The month of June holds the record with a total of 289,011 cars and trucks. During July, production dropped to 245,414 machines, a seasonal falling off which was not unexpected. In August, however, contrary to expectations the seasonal slump did not continue. Neither did the coal and railway strikes have the depressing effect looked for in many quarters. The advent of new models and a sharp fall buying movement resulting from a desire to take advantage of price reductions, stimulated an increase in production over July.

**Share markets continued** their upward advance during August, the average price of 50 stocks, 25 rails and 25 industrials, reaching 86.66 as compared with 81.25 for July. In the movement starting in the early part of July new high records were established in the last seven days of August. Strikes in the railroad, textile, coal and steel industry had practically no effect on prices, the public buying high grade seasoned rails and industrials with supreme confidence in the country's prosperity. Excellent crop prospects added stimulus to the buying activity during the month.

**Bituminous coal prices,** as indicated by *Coal Age* index, averaged 507 during August, the average spot price for the same period being $6.14. While the accompanying chart shows merely the monthly fluctuations, the highest point reached during the recent strike was on July 31, the index rising sharply to 556. August 7 witnessed a drop to 511. On August 14, due to a lack of available spot coal, the index again rose to 550. From this point there has been a continued downward movement, the index reaching 437 on August 31, resulting in an average for the month of 507. Despite the increase in supplies as the mines have opened, consumers have postponed buying, the weakened demand bringing prices down.

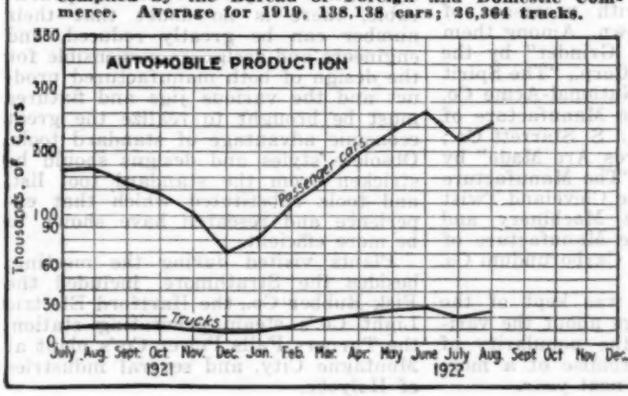
**Reserve ratio** of the Federal Reserve System remained practically unchanged during the week ending September 27, at 78.4 per cent. Foreign exchanges were downward with sterling at $4.39¼, the lowest in three months. French francs and Italian lire show but slight change as compared with the week previous. Bank of England's reserve declined slightly, from 19.61 per cent on September 21, the year's high point, to 19.40 per cent on September 28.

## Comparative Prices of Shop Supplies

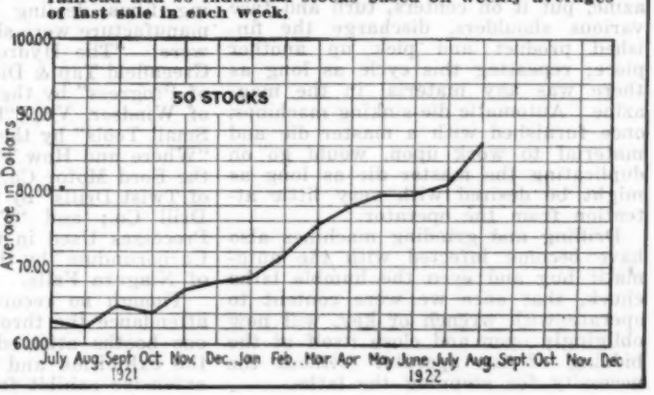
Average of New York, Chicago and Cleveland Prices

| | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.0289 | $0.0280 | $0.0273 |
| Cold finished shafting | per lb. | 0.0373 | 0.0360 | 0.0384 |
| Brass rods | per lb. | 0.1717 | 0.166 | 0.1350 |
| Solder (½ and ½) | per lb. | 0.228 | 0.221 | 0.202 |
| Cotton waste | per lb. | 0.115 | 0.11 | 0.113 |
| Washers, cast iron (⅜ in.) | per 100 lb. | 4.30 | 4.00 | 5.00 |
| Emery, disks, cloth, No. 1, 6 in. dia | per 100 | 3.11 | 3.11 | ..... |
| Lard cutting oil | per gal. | 0.575 | 0.575 | ..... |
| Machine oil | per gal. | 0.36 | 0.36 | ..... |
| Belting, leather, medium | off list | 40–5% @50% | 40–5% @50% | |
| Machine bolts up to 1 x 30 in. | off list | 55% @60% | 50%@ 65–10% | 50%@ 60–10% |

**Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Average for 1919, 138,138 cars; 26,364 trucks.**




**New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.**



## Machine Tool Exhibition Widely Attended

One of the most satisfactory and widely attended exhibitions of machine and small tools ever held in New England closed Saturday, September 23, after a three days' run. The exhibition, which was under the joint auspices of Yale University, the New Haven branch of A.S.M.E., and the New Haven Chamber of Commerce, was held in the Mason Laboratory of the Sheffield Scientific School, 9 Hillhouse Ave., New Haven, Conn.

The exhibitors numbered well over one hundred and included practically all of the better known New England firms identified with the machine tool trade. Exhibits ranged from small cutting tools, drills, taps, reamers, saws, etc. measuring tools and instruments of precision, to the larger and heavier classes of automatic and semi-automatic production machinery.

The growing importance of the elimination of friction in moving machinery was attested by the exhibits of the ball bearing manufacturers, all of whom in New England were represented. Manufacturers of abrasive wheels showed entertaining and instructive exhibits of the stages and processes that go to the making of a complete wheel from the raw materials. Steel manufacturers were represented with exhibits showing fractures of various grades of steel, the steps taken in its manufacture, and records of its performances.

### Automatic Machinery Progress

Small precision machine tools for use in watch, tool and gage work, in the production of which class of machinery New England has always taken a premier position, were well in evidence. Some of this machinery was in operation on actual production work and attracted a good deal of attention.

Perhaps the most noticeable tendency in machine design disclosed by the exhibition is the trend toward automatic production in operations that have hitherto been looked upon as necessarily manual. A few years ago machine tool builders were satisfied to furnish a machine or tool that would do its allotted work quickly and well under the guidance of a skilled operator. Today in many cases the machine is expected to be left to itself after being supplied with work, and to go on repeating its cycle of operations as long as any material remains.

Notable among this class of machinery was the engine lathe, which would take a bar of stock from a magazine, put it on centers, turn and face various shoulders, discharge the finished product and pick up another piece; repeating this cycle as long as there was any material in the magazine. Automatic die-sinking machines, once furnished with a master die and material to work upon, would go on duplicating the master die as long as might be desired with very little attention from the operator.

Drilling and grinding machines also have become infected with the automatic bug and even the humble lathe chuck, that once we were content to operate with wrench or key, will now obligingly open and close itself at the bidding of the operator without the necessity for stopping the lathe.

The advance in the art of taking precise measurements and making minute comparisons was well attested by the exhibitors of tools and gages for this purpose. To these instruments the one-hundred-thousandth part of an inch is a reality amply capable of demonstration.

Portable tools for drilling and grinding, stimulated by the remarkable development of the small electric motor, have made rapid strides and it is now possible to do many minor operations of machining that heretofore required the service of a permanently located machine, upon smaller tools that may be transported to and set up on the job, needing only to be attached to a convenient lamp socket to put them in operation.

### Many Important Papers Read

The speaking program of the exhibition was opened upon Thursday evening by Kenneth F. Lees, Chairman of the Committee for the New Haven branch A.S.M.E., who introduced L. P. Breckenridge, professor of mechanical engineering at Yale, as chairman of the meeting. Greetings from the New Haven Chamber of Commerce were extended by Henry B. Sargent of that organization. Charles H. Warren, dean of Sheffield Scientific School, earnestly advocated closer co-operation between the colleges and the machine tool industry. James T. Hartness, Governor of Vermont and an ex-president of the A.S.M.E., delivered an address upon the "Influence of the Machine Tool in America."

On Friday evening, M. D. Liming, manager of the Boston Chamber of Commerce, spoke upon the "Outlook for Industry in New England" and Earle Buckingham, engineer at Pratt & Whitney Co., gave a talk upon "Precision, Standardization and Production," followed by an address upon the subject of "Standardization Activity in Germany" by Oscar Wikander, Consulting Engineer with the S.K.F. industries.

Saturday evening's programme included a talk by William Calkins, Metallurgist for the Detroit Twist Drill Co., upon the "Design, Manufacture and Performance of Twist Drills," the talk being illustrated with the stereopticon; "Application of Graphic Control to Machine Manufacture" by Gardner T. Swarts, Jr. of the Educational Exhibit Co.; and "Analysis of Income in the United States" by Oswald W. Knauth, Secretary National Bureau of Economic Research.

On Friday and Saturday afternoons the moving picture projectoscope belonging to the Laboratory was pressed into service and a number of interesting films dealing with processes of manufacture were shown. Among them were: "The Hydroil Grinder" by the Greenfield Tap & Die Corp., "The Spirit of Progress" by the National-Acme Co. of Windsor, Vt.; "The Manufacture of Small Tools" by the L. S. Starrett Co.; "Where and How Fords Are Made" by the Ford Motor Co.; "The Manufacture of Twist Drills" by the Cleveland Twist Drill Co.; and "The Machinery and Processes Used in the Manufacture of Carborundum" by the Carborundum Co. of Niagara Falls.

Though no record was kept of the attendance the throngs about the various booths attested the popularity of the exhibition and promise of a more extensive exhibit for next year.

## New England A.S.M.E. Holds Regional Meeting

The New England regional meeting of the American Society of Mechanical Engineers was held at Hotel Kimball, Springfield, Mass., Sept. 25-27, under the auspices of the Engineering Society of Western Massachusetts, with the Worcester, Providence, Connecticut and Eastern New York sections and affiliated technical societies of Boston represented. Charles L. Newcomb, manager of the Worthington Pump and Machinery Co.'s plant in Holyoke, was chairman of the sessions.

At the opening session Monday morning the discussion related to industrial power plants, with C. C. Chesney, manager of the General Electric Co.'s Pittsfield (Mass.) plant, acting as chairman. R. A. Packard, superintendent of power and shop for the Ludlow Manufacturing Associates, led the forum with a paper on "Multiple Source of Power for Reliable Industrial Plant Operation."

Tuesday morning there were simultaneous sessions on textiles and tools, with Dr. H. C. Emerson and A. L. Bausman as the respective chairmen. In the textile division a paper was read by Wendell S. Brown, of F. P. Sheldon & Son, Providence, on "Preservation of Decaying Wood Roofs," telling how the destructive effects of "damp rot" due to high or great humidity in mills and shops could be combated.

### Machine Tool Standardization

In the tool section a paper on "Suggestions as to the Standardization of Machine Tools," by Fred H. Colvin and K. H. Condit, editors of the *American Machinist*, was read. The subject was treated from the viewpoint of the user, as related to work-holding and tool-holding devices. He further suggested as a probability that the machine tool builders may find standardization desirable in a greater degree, thus tending to simplify manufacture and reduce the number of tools, gauges and bearings carried in stock. While the engineer may recommend standardization, the decision of the manufacturer alone can assure its extention. Here the question resolves itself into a "selling" problem, for which the average engineer is not temperamentally suited, but for which machinery already exists in the American Engineering Standards Committee.

This was followed by a paper on "Standardization of Small Tools," by C. J. Oxford, chief engineer of the National Twist Drill and Tool Co., Detroit. He said that while the total elimination of special tools is impracticable, there is no doubt that their number can be greatly reduced, and engineers and designers responsible for the design of both manufactured product and the various jigs and fixtures must be brought to realize the great economic advantage of standard tools. Obsolete styles and designs should be stricken from the standard tool list, and tools substituted which that experience and research have shown to be more efficient.

Plants visited during the meeting, besides the Strathmore, included the Fisk Rubber Co., the Hartford Electric Light Co.'s steam generating station, the Turners Falls Power Co.'s plant at Montague City, and several industries of Holyoke.

## What the 67th Congress Accomplished

Despite lengthy debates over leading measures and the political atmosphere which was spread over many of the proceedings, the second session of the Sixty-seventh Congress, which came to an end Sept. 22 after having extended from Dec. 5, 1921, enacted considerable important legislation.

The Democratic minority, although overwhelmingly outnumbered, was active and well led throughout the session in both branches of Congress. The Republican majority proved unwieldy because of its size, this fact tending to slow the transaction of business rather than to expedite it. The session developed and solidified the "bloc" system—that is, the agricultural bloc in both Senate and House, the farm tariff bloc in the Senate and the Henry Ford-Muscle Shoals bloc in the House, each bi-partisan in character, with indications that a ship subsidy bloc of similar nature probably will make its appearance at the next session.

During the session, appropriation bills providing for the expenditure of upward of $2,250,000,000 were passed, estimates having been reduced more than $300,000,000. There were 251 laws enacted at the session.

On the negative side, the session failed to take final action on the administration ship subsidy bill, the $5,000,000 Liberian loan, a corrupt practices act, the anti-lynching bill, extension of land reclamation, disposition of the Muscle Shoals project and a large number of measures less before the public eye.

### Tariff the Chief Business

Enactment of the Fordney-McCumber tariff bill, the first permanent Republican protective tariff written on the statute books since the Payne-Aldrich bill of 1909, was the outstanding accomplishment of the session which affects business interests directly.

Excepting in isolated instances, the new tariff rates are higher than those of the Underwood-Simmons Democratic tariff law of 1913, but with the exception of the duty on raw wool and the rates of the agricultural schedule, the new tariff is lower than the Payne-Aldrich bill. The new tariff act marks a distinct advance in such legislation in its flexible tariff section, by which rates may be increased or decreased by Presidential proclamation upon proper showing, and by the section through which the authority of the Tariff Commission is broadened greatly with a view toward having a more scientific basis of framing future import duties. Among other important acts of the last session of Congress were:

Approval of seven treaties resulting from the Conference on Limitation of Armament, and legislation to scrap certain naval vessels in accordance with these treaties.

Reduction of personnel of the army and navy, with consequent reductions in appropriations.

Provision for the appointment of 24 additional judges for Federal district courts, and one additional circuit court judge.

Extension of the 3-per cent immigration law for two years.

Extension of the War Finance Corporation and enlargement of the revolving fund of the Farm Land Bank, together with provision for appointment of a "dirt farmer" on the Federal Reserve Board, for the agricultural interests.

Appropriation of $17,000,000 for additional hospitals for veterans of the world war.

Provision for organization of irrigation districts.

Passed the China trade act, the forerunner of other legislation to bring American corporations operating abroad on an equal basis with foreign competitors regarding taxation and protection.

Monthly payment of civil war pensions.

Appropriation of $7,500,000 to continue work on Wilson dam at Muscle Shoals.

Creation of the allied debt refunding commission.

Passage of the grain futures bill to overcome objections pointed out by the Supreme Court.

Congress also passed the bonus bill for veterans of the world war, but this was vetoed by the President because it made no provision for raising revenue to meet the obligations it created, and the veto was sustained by the Senate.

## Business Items

The General Motors Corporation directors at their meeting held in New York last week declared the regular quarterly dividends as follows: Six per cent preferred, $1.50 a share; 6 per cent debenture, $1.50 a share; 7 per cent debenture, $1.75 a share. These dividends are all payable November 1, 1922, to stockholders of record at the close of business October 9, 1922.

The Davis Boring Tool Co., St. Louis, Mo., manufacturer of boring tools and expansion reamers, has just purchased a factory site fronting on Forest Park Boulevard on the corner of Spring Ave., and preliminary work has been started for the erection of a modern three-story factory.

The International Combustion Engineering Corporation has acquired the entire capital stock of the Green Engineering Co., East Chicago, Ind. The works of the Green Engineering Co. are located about fifteen miles from Chicago and the company is engaged in the manufacture of chain grate stokers, auxiliary boiler room equipment, special furnace arches and general foundry work.

The Armstrong Steel Co. plant will be constructed in Houston, Tex., at a cost of $2,000,000 and will employ several thousand men. Headquarters of the plant, now located in Fort Worth, will be moved to Houston after the plant is completed. The new plant will have a capacity of 60,000 tons annually, turning out manufactured steel products from a combination of pig iron and scrap iron by an open hearth process. The capacity of the company's plant in Fort Worth is 40,000 tons annually.

The Milwaukee Air Power Pump Co., Milwaukee, Wis., manufacturer of the Milwaukee air power water system, is building a new factory on Keefe Avenue, near Humboldt Boulevard, which is to be completed by the first of the year. John R. Ball is president and H. S. Rogers is vice-president and engineer in charge.

The Westinghouse Electric and Manufacturing Co., announces the establishment of a central station division in its Boston office, with C. M. Bates as manager and F. L. Nason as assistant manager. A merchandising division also has been established in the office with Mr. Nason as acting manager. J. P. Alexander has been appointed manager of the new transportation division in the same office.

The Chicago, Indianapolis & Louisville Railroad Co., according to an announcement made recently by officials in Indianapolis, has let contracts for eight new locomotives to be built by the American Locomotive Co. Five of the new engines are for freight and three for passenger service. It also was announced that orders have been placed with the Haskell-Barker Corporation at Michigan City for 150 new coal cars. Five new passenger coaches also have been ordered.

The Baldwin Locomotive Works, according to reports last week, had unfilled orders on its books aggregating about $37,000,000 in value and that the plants were now employing about 11,000 men and operating at approximately 60 per cent of capacity.

The Racine Metal Stamping Co., of Racine, Wis., Albert O. Falkenrath, president, announces a change in its corporate name to Racine Screw Works.

The Chicago Pneumatic Tool Co. earnings are running at a rate slightly above its dividend requirements and the volume of its business is about two and one-half times that of the early months of 1922, according to Charles M. Schwab, chairman of its board of directors.

The Ford Motor Co., according to reports, has been given a new production mark to aim at next year. Orders have been given to all general foremen to speed up production and install additional machinery with the view to making 6,000 cars a day by April 1, 1923.

The Packard Motor Car Co. according to reports is expected to show for the fiscal year ending August 31, net profits after charges and taxes, in excess of $1,000,000, or just about dividend requirements of $1,035,286 on $14,789,800 7 per cent preferred stock. In the preceding year the loss was $3,487,366 from operations and inventory depreciation, and after dividend payments of $1,346,410, there was a deficit of $4,833,776.

The Florida East Coast Railway, for the year ended Dec. 31, 1921, reports gross earnings of $13,579,109, a decrease of $122,082 from the previous year. Surplus earnings after all charges and taxes totaled $766,705, a decrease of $1,444,291 compared with 1920.

The Midwestern Tool Co. has been organized with Carl O. Swenson as president and Samuel R. Swenson as secretary, treasurer and general manager, and will be located at 5215 Ravenswood Ave., Chicago, Ill. The company has taken over the assets of the Ajax Tool Co. and will engage in the manufacture of hobs, milling cutters, tools, jigs and fixtures, and will also manufacture oversizes pistons for

the automotive trade. Samuel R. Swenson is well known to the trade through his former connections with the Goddard Tool Co., the Illinois Tool Co., and the Barber-Colman Co.

The American Machine and Foundry Co. stockholders have been called into a special meeting to be held on October 17 to vote upon a proposed increase in the company's capital stock from $2,000,000 to $10,000,000.

The Wiley-Hughes Supply Co., Trenton, N. J., has been incorporated in that city with a capitalization of $125,000 to deal in engineers' supplies. Leroy Wiley, Fred W. Hughes and Joseph Ashton, Jr., all of Trenton, are the incorporators.

The Westinghouse Electric and Manufacturing Co. makes the announcement that in its San Francisco office, the power division is changed to the central station division and W. P. L'Hommedieu has been appointed manager. Mr. L'Hommedieu will also be responsible for the sale of supply apparatus in the San Francisco district. The railway division has been changed to the transportation division and E. A. Palmer has been appointed manager. The establishment of a merchandising division, with H. L. Garbutt as manager is also announced.

The Republic Iron and Steel Co. is running its plants at about 80 per cent of capacity and the company, it is said, is booked practically full until the end of the year.

The Auburn Automobile Co., has declared the regular quarterly dividend of 1¼ per cent on its preferred and 1 per cent on its common stock, payable Oct. 1.

The Bethlehem Export Corporation, which has been incorporated in Delaware with a capitalization of $1,000,000, is the export subsidiary of the Bethlehem Steel Corporation. The action of the Bethlehem Steel Corporation in organizing an exporting subsidiary follows the decision to liquidate the Consolidated Steel Corporation, which has been handling the foreign business of 11 steel companies in this country.

The Ford Motor Co. is reported to have purchased recently a tract of fifteen acres in the eastern section of Toronto, Can., whereon it will erect an assembly plant to have approximately 150,000 square feet of floor space.

The Union Pacific Railroad system for August reports gross railway operating revenues of $17,627,803, against $20,041,541 in the same month last year. Of the $2,413,738 decrease in gross, $1,799,841 was due to smaller revenues from freight and $362,436 to smaller passenger revenue. Operating expenses aggregated $13,127,553, against $13,663,803 last year.

The Nash Motors Co. has declared a quarterly dividend of $1.75 on its preferred stock, payable Nov. 1.

The Rockwood Manufacturing Company, of Indianapolis, is to remodel its foundry into a machine shop and will build a one story extension to the present building, according to George O. Rockwood, president. The contract has been let and work is expected to begin shortly. The building, when added to and remodeled will be of brick and heavy mill construction, with wood block floors, steel sash, a gravel roof and a traveling crane.

The Hudson Motor Car Co., will pay its regular quarterly dividend of 50 cents per share on the capital stock on Oct. 5.

The Westinghouse Electric and Manufacturing Co. announces the following appointments in its St. Louis office: S. W. Perry as chief clerk; W. F. Barnes as manager of the industrial division; J. S. Warren as manager of the central station division and G. F. Leake as manager of the merchandising division.

The Springfield Commercial Body Co., Inc., has been formed in Springfield, Mass., with a capitalization of $200,000. Charles B. Ring is president and L. Philip Smith is treasurer of the new company which will engage in the manufacture of automobile bodies.

The Hermann Tire Building Machine Co., Columbus, Ohio, has been sold to W. H. Hermann, as has also the plant of the A. R. McDonald Co., St. Marys, Ohio. Machinery for making tools used in the production of casings and tubes will be installed in the latter plant.

The Willys-Overland Co. and subsidiaries for six months ended June 30, 1922, reports a net loss of $163,305 after depreciation and interest charges. After charging out $35,000 for contingencies, $250,000 for inventory losses and $570,909 for discount and expense of gold note issue deficit was $1,019,214 from which $26,750, which was deducted as dividend stock of employes and others returned to company, leaving net deficit for the period $992,464.

The Velie Motors Corporation has declared the regular quarterly dividend of 1¾ per cent on its first preferred stock, payable Oct. 2.

The Thomaston Knife Co., Thomaston, Conn., recently incorporated under the laws of Connecticut with a capital stock of $60,000, to engage in the manufacture of knives, cutlery, etc., organized the past week by the election of the following officers: president, Henry S. Hitchcock; secretary and treasurer, James D. Wedgewood, both of Woodbury, Conn.

The Holbrook Co., Hudson, N. Y., manufacturer of automobile bodies, plans the construction of additional plant capacity at a cost of approximately $100,000.

The American La France Fire Engine Co., Inc., has declared the regular quarterly dividend of 2½ per cent on its common stock, payable Nov. 15.

The Youngstown Sheet and Tube Co., dividend, payable October 1, was increased to 75 cents a share at the meeting of the board of directors held recently at Youngstown, Ohio. The previous quarterly payment was 50 cents the share. The regular quarterly preferred dividend of $1.75 a share, also payable October 1, was likewise declared. The dividends in each instance are payable to stock of record September 20. The increase in the common rate is the first since the improvement in the steel industry. It is just one-half of the quarterly rate first paid on the common after the original shares of preferred of $100 par value were each split into four shares of no par value in 1920. The increase of 25 cents a share will add $200,000 to that company's quarterly disbursement on October 1.

The Asa S. Cook Co., Hartford, Conn., manufacturer of wood screw and bolt machinery, has moved its Cleveland office to 344 Engineers' Building, that city. Ernest W. Duston is the sales engineer in charge.

The Hupp Motor Co. will pay its regular quarterly dividend of $1.75 on the preferred stock on Oct. 1.

The Brown Instrument Co., announces the opening on Sept. 1, of its New England Branch 185 Devonshire Street, Boston, Mass., with George Goodman in charge.

The Ford Automobile Co. is reported to have bought a large tract of land on the outskirts of Antwerp, where an assembling plant will be erected. The plant will be ready for operation early next year. The factory force will be made up chiefly of Americans. Automobile parts will be sent from Detroit to Brussels and the cars assembled here.

The Southern Pacific Co. reports for August a decrease of $756,215 in net railway operating income, after expenses, rents, etc., as compared with the same month a year ago, thereby reducing that figure to $4,566,641. Operating revenues totaled $23,160,148, a decrease of $1,052,764. The drop in earnings is largely due to the result of the second month of the railway shopmen's strike.

## Personals

DR. FEDERICO GIOLITTI, Italian metallurgist, was the guest of honor at a luncheon at the Bankers' Club, 120 Broadway, New York City, last week, where he was met by members of the iron and steel committee of the American Institute of Mining and Metallurgical Engineers. Dr. Giolitti was managing director during the war of the great Ansaldo works at Genoa.

SAMUEL MACCUTCHEON, assistant secretary of the North & Judd Manufacturing Co., New Britain, Conn., manufacturer of hardware, tools, etc., has been elected treasurer of the concern, by the directors, at a meeting held recently.

P. G. MERROW, secretary and treasurer of the Merrow Machine Co., Hartford, Conn., recently sailed for an extended trip abroad on business in the interests of his company. Mr. Merrow expects to visit the company's connections in Great Britain and on the Continent.

W. C. LEITCH, formerly representative at St. Louis, Mo., of the general sales division of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently been transferred to the general offices at Springfield. E. F. BLACKBURN, who has been representative of the company at Fort Worth, Tex., succeeds Mr. Leitch, at St. Louis.

FRANK L. ATWOOD, who has been vice-president of the Midwest Engine Co., Anderson, Ind., will become general manager of the Hill pump plant in the same city, October 1. The sales and mechanical departments of the Hill plant will be moved from Indianapolis to Anderson.

L. A. NYE of the Cleveland office of

the Norton Co., has been transferred to the Cincinnati office, taking the place of A. F. Mellon, who resigned recently.

C. H. WESTON of the drafting department of the Norton Co., Worcester, has assumed the duties of Robert H. Cannon, recently transferred to the Cleveland sales staff.

E. H. ANTHONY has been appointed manager of the Chicago office for the Union Twist Drill Co., to succeed E. P. Walker, who is now with the S. W. Card Tap Co.

FREDERICK M. HOLMES was, during the past week, elected president of the North & Judd Manufacturing Co., manufacturers of hardware, tools, etc., New Britain, Conn., succeeding the late HOWARD C. NOBLE. Mr. Holmes has held various capacities since joining the company in June, 1900.

ROBERT H. LIBKE, formerly a member of the E. L. Essley organization, has been appointed Chicago district manager for the Toledo Machine and Tool Co.

F. W. PRATT, formerly advertising manager for the Goodell-Pratt Co., Greenfield, Mass., has been appointed to the post of manager of production, retaining his former title of assistant to the president.

ROBERT H. CANNON, for some time past connected with the sales engineering department of the Norton Co., Worcester, Mass., has joined the sales staff of the Cleveland office of the company.

H. H. COLBUS, formerly sales representative of the Halcomb Steel Co., has become associated with the Down Tool Works, Inc., Fleetwood, Pa., manufacturer of high speed drills and tools, with headquarters in Philadelphia.

H. G. HOBBS has recently become associated with the Gilbert & Barker Manufacturing Co., Springfield, Mass., as the company's representative in southern Ohio, making his headquarters in Columbus. Mr. Hobbs was formerly located in Winnipeg and Toronto, Canada, for the company.

SIDNEY W. FARNSWORTH of Evanston, Ill., former aide to Commander McDowell, a member of the staff of Admiral Sims during the war and more recently associated with the Steel and Tube Co. of America, has been appointed by Postmaster General Work as chief engineer of the Post Office Department. The position is a new one created in order that a mechanical engineer may pass upon the labor-saving devices which the Post Office Department may require in order to secure expeditious handling of the mails.

## Obituary

MARCELLUS L. BAILEY, treasurer of the Union Manufacturing Co., manufacturer of chucks, gray iron castings, etc., New Britain, Conn., died at his home in that city, Sept. 26, following a long illness. Mr. Bailey was born in New Britain Dec. 31, 1856. He has been with the Union Manufacturing Co. for forty-five years.

J. W. KINNEAR, president of the American Stainless Steel Co., Pittsburg, Pa., died at his home in that city on September 8.

## Export Opportunities

**The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above addresss by referring to the number following each item.**

Shoemaking machinery of all descriptions for making cloth shoes—Spain. Purchase desired. Quotations, f. o. b. New York. Reference No. 3643.

Rubber sheeting 8 by 4 feet and $\frac{1}{8}$ to 1 inch thick, proof canvas and tarpaulin, complete with eyelets, 24 by 18 feet; and tool spring and cast steel, flat, round, and octagon—India. Purchase desired. Quotations, c. i. f. Karachi. Terms, cash against documents. Reference No. 3666.

Soft steel or puddled iron wire of best quality, galvanized for telegraphs; cast-iron pipe for water, interior diameters 50 to 250 millimeters and 3 and 4 meters in length; concrete mild steel bars; beams, T's, double T's, U's, and angles; and plain and corrugated galvanized sheets, 0.3 to 1.2 millimeters thick—Greece. Agency and purchase desired. Quotations, c. i. f. Piraeus. Payment, confirmed letter of credit in New York or against documents. Correspondence, French. Reference No. 3669.

Vulcanizer molds, assorted sizes, from 30 by 3 inches to 35 by 5 inches—Scotland. Purchase is desired. Quotations, f. o. b. nearest port. Payment, cash. Reference No. 3670.

Electric plants, machinery, hardware, groceries, timber, plain and galvanized iron, paints, woolen goods, soft goods, boots and shoes, leatherware, motor cars, motor lorries, tractors, drills and tools, and any lines required by the Government or general merchants—South Africa. Reference No. 3673.

Iron piping for gas, from $\frac{1}{4}$ to 4 inches in diameter; and steel piping for drilling and boilers, from 5 to 18 inches in diameter—Italy. Purchase and agency desired. Quotations, c. i. f. Genoa. Reference No. 3675.

Machinery for manufacturing glucose—Mexico. Purchase desired. Catalogs of such machinery and instructions as to the proper way of manufacturing are requested. Quotations, f. o. b. American port. Payment, cash. Reference No. 3679.

Outboard motors of $2\frac{1}{2}$ and 5 horsepower—Egypt. Purchase and agency desired. Quotations, c. i. f. Port Said. Cash will be paid against documents for samples. Reference No. 3683.

Telephone equipment, electric generators, internal-combustion power plants, low-pressure water wheels, rotary pumps, electric lighting equipment, and lighting equipment—Egypt. Representation of manufacturers desired by importers. Reference No. 3709.

## Pamphlets Received

**The Western European Division and American Business.** Department of Commerce bulletin describing that part of the department's organization which specializes in aiding American business in its foreign trade with Western Europe.

**Our World Trade.** Foreign Commerce Department of the U. S. Chamber of Commerce. This publication is a detailed analysis of American foreign trade covering the period from January to June, 1922, with statistical tables showing value and volume of exports and imports.

**Latin America.** Trade and Economic Review for 1921, No. 9, on the economic conditions in, and the state of the U. S. trade with Latin America. Published and distributed by the Department of Commerce, Washington, D. C.

**Hongkong.** Trade and Economic Review for 1921, No. 10, on the economic conditions in, and the state of the foreign trade of Hongkong. Published and distributed by the Department of Commerce, Washington, D. C.

**How the Far Eastern Division Serves the Business Public.** Bureau of Foreign and Domestic Commerce Publication, containing instructive information regarding that part of the Department's organization which specializes in furnishing aid on Far Eastern commerce matters.

## Trade Catalogs

**Chucks.** The Skinner Chuck Co., New Britain, Conn.—An interesting little book, "Chucks and Their Uses," has just been published by the Skinner Chuck Co. In order to facilitate the use of this book and standardize courses of instruction on the proper use of chucks, a supplementary booklet has been issued, to be distributed together with "Chucks and Their Uses." The title of this supplement, "Questions and Answers," indicates the nature of the booklet, which includes a series of the most logical questions arising in the minds of people handling chucks and gives correct and helpful answers to these questions.

**Steel Stools and Chairs.** The Angle Steel Stool Co., Plainwell, Mich. A folder with illustrations describing a varied line of steel stools and chairs suitable for factory and office use. The company has also just published a supplementary catalog illustrating and describing, not only its chair and stool line, but its various types of steel trucks, merchandise conveyors and steel cans for oily and other waste substances.

**Signalling and Alarm Instruments.** The Brown Instrument Co., Philadelphia, Pa. This company has just issued a new publication, known as catalog No. 85, containing considerable technical data, illustrations and charts bearing on its automatic control signalling and alarm instruments, its pyrometers and other apparatus for temperature control.

**Expansion Reamers.** The Davis Boring Tool Co., St. Louis, Mo. An illustrated folder with line drawings and complete details regarding the Davis line of expansion reamers.

## Forthcoming Meetings

**American Welding Society,** Fall Meeting, October 2 to 5, in Chicago, Ill. Secretary, Howard C. Forbes, 33 West 39th St., New York City.

**American Society for Steel Treating.** Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

**Second National Aero Congress and National Airplane Races.,** Detroit, Mich., October 7 to 14, 1922.

**American Gear Manufacturers' Association.** Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

**National Association of Farm Equipment Manufacturers.** Annual Convention, October 18 to 20, Congress Hotel, Chicago.

**Society of Industrial Engineers.** Oct. 18 to 20. McAlpin Hotel, New York. Secretary, George C. Dent, 327 South LaSalle St., Chicago.

**American Manufacturers Export Association,** annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

**American Trade Association Executives.** Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Bucks Falls, Pa. (Delaware Water Gap).

**Automotive Equipment Association.** Annual show and meeting, November 13 to 18, Chicago, Ill.

**National Founders' Association,** Nov. 22 and 23. Secretary, J. M. Taylor, 29 South LaSalle St., Chicago, Ill.

**Eighteenth Annual Automobile Salon,** Commodore Hotel, New York City, December 3 to 9, 1922.

**American Society of Mechanical Engineers,** annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

**National Exposition of Power and Mechanical Engineering.** Dec. 7 to 13, 1922, Grand Central Palace, New York City Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

**National Automobile Chamber of Commerce,** National Automobile Show, Grand Central Palace, New York City, January 6 to 13, 1923.

**National Automobile Chamber of Commerce,** National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

# The Weekly Price Guide

## RISE AND FALL OF THE MARKET

**Advances**—Demand for car materials strongest feature of the market. Standard rails advanced $3 per ton, Oct. 1. Steel plates, $2@$2.15 per 100 lb., f.o.b. Pittsburgh, for fair tonnages on ordinary business; $2.25@$2.50, however, quoted on small tonnages and for immediate deliveries. Demand for structurals light; $2@$2.15 quoted, with occasional small lots at $2.25. Shortage of steel bars. Few mills taking on new steel business except on indefinite delivery basis. Steel sheets up 15c.@20c. per 100 lb. at Cleveland warehouses. Hoop steel, shapes, plates, bars and bands up 10c. in New York.

Electrolytic copper, 14⅜c. as against 14⅛c.; tin, 32⅜c. advanced from 32⅛c. and lead, 6⅛c.@6¼c. as compared with 6¼c. per lb., f.o.b. New York, last week. Chinese antimony advanced and fabricated brass products up ⅛c.@¼c. per lb. in New York and Cleveland warehouses. Zinc higher in East St. Louis. Fabricated copper prices, stable. Long terne plates (base) up 20c. per lb. in Cleveland. Connellsville coke $1 per ton higher, for prompt furnace and foundry.

**Declines**—Slightly softer pig-iron market due to increased production. Higher prices expected, however, owing to advance in coke.

## IRON AND STEEL

**PIG IRON**—Per gross ton—Quotations compiled by The Matthew Addy Co.:

| | |
|---|---|
| **CINCINNATI** | |
| No. 2 Southern | $34.27 |
| Northern Basic | 32.27 |
| Southern Ohio No. 2 | 34.27 |
| **NEW YORK—Tidewater Delivery** | |
| Southern No. 2 (silicon 2.25@2.75) | 36.27 |
| **BIRMINGHAM** | |
| No. 2 Foundry | 27.50 |
| **PHILADELPHIA** | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 36.64 |
| Virginia No. 2 | 37.17 |
| Basic | 34.00 |
| Grey Forge | 33.00 |
| **CHICAGO** | |
| No. 2 Foundry local | 32.00 |
| No. 2 Foundry, Southern (silicon 2.25@2.75) | 31.50 |
| **PITTSBURGH, including freight charge from Valley** | |
| No. 2 Foundry | 35.00 |
| Basic | 32.50 |
| Bessemer | 33.00 |

**IRON MACHINERY CASTINGS**—In cents per pound:

| | Light | Medium | Heavy |
|---|---|---|---|
| Cincinnati | 8.0 | 6 0 | 5@5½ |
| Detroit | 10@12 | 8.0 | 3@4 |
| New York | 9@10 | 6.0 | 4 0 |
| Cleveland | 8.0 | 5.25 | 4 5 |
| Chicago | 6.0 | 5.0 | 4 0 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

| Blue Annealed | Pittsburgh, Large Mill Lots | New York | Cleveland | Chicago |
|---|---|---|---|---|
| No. 10 | 2 50@2.75 | 4.19 | 3.70 | 4.00 |
| No. 12 | 2.60@2.85 | 4.24 | 3.75 | 4.05 |
| No. 14 | 2.70@2.90 | 4.29 | 3.80 | 4.10 |
| No. 16 | 2.90@3.20 | 4.39 | 3.90 | 4 20 |
| **Black** | | | | |
| Nos. 17 and 21. | 3.20@3.35 | 4.70 | 4.20 | 4.70 |
| Nos. 22 and 24. | 3.25@3.40 | 4.75 | 4.25 | 4 70 |
| Nos. 25 and 26. | 3.30@3.45 | 4.80 | 4.30 | 4.75 |
| No. 28 | 3.35@3.50 | 4.90 | 4.40 | 4.85 |

| Galvanized | Pittsburgh | New York | Cleveland | Chicago |
|---|---|---|---|---|
| Nos. 10 and 11. | 3.35@3.75 | 4.90 | 4.40 | 4.85 |
| Nos. 12 and 14. | 3.45@3.85 | 5.00 | 4.50 | 4.95 |
| Nos. 17 and 21. | 3.75@4.15 | 5.30 | 4.80 | .... |
| Nos. 22 and 24. | 3.90@4.30 | 5.45 | 4.95 | 5.40 |
| No. 26 | 4.05@4.45 | 5.60 | 5.10 | 5.55 |
| No. 28 | 4.35@4.75 | 5.90 | 5.40 | 5.95 |

**WROUGHT PIPE**—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

| Steel Inches | Black | Galv. | BUTT WELD Inches | Iron Black | Galv. |
|---|---|---|---|---|---|
| 1 to 3 | 68 | 56½ | ⅜ to 1½ | 39½ | 24½ |
| **LAP WELD** | | | | | |
| 2 | 61 | 49½ | 2 | 34½ | 20½ |
| 2½ to 6 | 65 | 53½ | 2½ to 4 | 37½ | 24½ |
| 7 to 8 | 62 | 49½ | 4½ to 6 | 37½ | 24½ |
| 9 to 12 | 61 | 48½ | 7 to 12 | 35½ | 22½ |
| **BUTT WELD, EXTRA STRONG, PLAIN ENDS** | | | | | |
| 1 to 1½ | 66 | 55½ | ⅜ to 1½ | 39½ | 25½ |
| 2 to 3 | 67 | 56½ | | | |
| **LAP WELD, EXTRA STRONG, PLAIN ENDS** | | | | | |
| 2 | 59 | 48½ | 2 | 35½ | 22½ |
| 2½ to 4 | 63 | 52½ | 2½ to 4 | 38½ | 26½ |
| 4½ to 6 | 62 | 51½ | 4½ to 6 | 37½ | 25½ |
| 7 to 8 | 58 | 45½ | 7 to 8 | 30½ | 18½ |
| 9 to 12 | 52 | 39½ | 9 to 12 | 25½ | 13½ |

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

**WROUGHT PIPE**—Warehouse discounts as follows:

| | New York Black | New York Galv. | Cleveland Black | Cleveland Galv. | Chicago Black | Chicago Galv. |
|---|---|---|---|---|---|---|
| 1 to 3 in. steel butt welded | 60% | 47% | 57½% | 45½% | 62½% | 48½% |
| 2½ to 6 in. steel lap welded | 57% | 44% | 55½% | 42½% | 59½% | 45½% |

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

**MISCELLANEOUS**—Warehouse prices in cents per pound in 100-lb. lots:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Open hearth spring steel (base) | 4.50 | 6.00 | 4.50 |
| Spring steel (light) (base) | 6.00 | 6.00 | 6.00 |
| Coppered Bessemer rods (base) | 6.03 | 8.00 | 6.10 |
| Hoop steel | 4.39 | 3.50 | 3.90 |
| Cold rolled strip steel | 6.75 | 8.25 | 7.25 |
| Floor plates | 5.50 | 5.06 | 5.50 |
| Cold finished shafting or screw | 3.90 | 3.60 | 3.70 |
| Cold finished flats, squares | 4.40 | 4.10 | 4.20 |
| Structural shapes (base) | 3.14 | 2.91 | 2.92½ |
| Soft steel bars (base) | 3.04 | 2.81 | 2.82½ |
| Soft steel bar shapes (base) | 3.04 | 2.81 | 2.82½ |
| Soft steel bands (base) | 3.84 | 3.61 | 3.55 |
| Tank plates (base) | 3.14 | 2.91 | 2.92½ |
| Bar iron (2.60 at mill) | 3.04 | 2.81 | 2.82½ |
| Drill rod (from list) | 55@60% | 40% | 50% |
| Electric welding wire: | | | |
| 5/16 | 8.00 | | 12@13 |
| ⅜ | 6.50 | | 11@12 |
| 5/16 to ¼ | 6.25 | | 10@11 |

## METALS

Current Prices in Cents Per Pound

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper, electrolytic (up to carlots), New York | 14.75 | | |
| Tin, 5-ton lots, New York | 32.75 | | |
| Lead (up to carlots), St. Louis 6.15; New York, 6.75@6.87½ | | | |
| Zinc (up to carlots), St. Louis, 6.86@6.90; New York | 7.50 | | |
| Aluminum, 98 to 99% ingots, 1-15 ton lots | 19.20 | 21.00 | 20.00 |
| Antimony (Chinese), ton spot | 7.25@7.37½ | 8.00 | 8.00 |
| Copper sheets, base | 21.50 | 22.00 | 23.00 |
| Copper wire (carlots) | 16.00 | 18.00 | 16.25 |
| Copper bars (ton lots) | 20.00 | 23.00 | 19.50 |
| Copper tubing (100-lb. lots) | 24.75 | 25.00 | 23.00 |
| Brass sheets (100-lb. lots) | 18.50 | 20.75 | 18.75 |
| Brass tubing (100-lb. lots) | 23.00 | 24.00 | 20.50 |

# —Shop Materials and Supplies

## METALS—Continued

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Brass rods (1,000-lb. lots) | 17.00 | 18.75 | 15.75 |
| Brass wire (carlots) | 19.00 | 20.75 | ..... |
| Zinc sheets (casks) | 9.25 | 9.50 | ..... |
| Solder (½ and ½), (caselots) | 25.00 | 23.50 | 20.00 |
| Babbitt metal (fair grade) | 25.00 | 42.25 | 36.00 |
| Babbitt metal (commercial) | 15.00 | 16.00 | 9.00 |
| Nickel (ingot and shot), Bayonne, N. J. | 36.00 | ..... | ..... |
| Nickel (electrolytic), Bayonne, N. J. | 39.00 | ..... | .... |

**SPECIAL NICKEL AND ALLOYS**—Price in cents per lb.

| | |
|---|---|
| Malleable nickel ingots | 45 |
| Malleable nickel sheet bars | 47 |
| Hot rolled rods, Grades "A" and "C" (base) | 50 |
| Cold drawn rods, Grades "A" and "C" (base) | 60 |
| Copper nickel ingots | 37 |
| Hot rolled copper nickel rods (base) | 45 |
| Manganese nickel hot rolled (base) rods "D"—low manganese | 54 |
| Manganese nickel hot rolled (base) rods "D"—high manganese | 57 |

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

| | | | |
|---|---|---|---|
| Shot | 32.00 | Hot rolled machined rods (base) | 48.00 |
| Blocks | 32.00 | Hot rolled rods (base) | 40.00 |
| Ingots | 38.00 | Cold drawn rods (base) | 50.00 |
| Sheet bars | 40.00 | Hot rolled sheets (base) | 45.00 |

**OLD METALS**—Dealers' purchasing prices in cents per pound:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper, heavy, and crucible | 12.00 | 12.25 | 12.00 |
| Copper, heavy, and wire | 11.75 | 11.75 | 11.50 |
| Copper, light, and bottoms | 9.75 | 10.00 | 10.50 |
| Lead, heavy | 4.75 | 5.00 | 4.75 |
| Lead, tea | 4.25 | 4.00 | 4.00 |
| Brass, heavy | 7.00 | 6.50 | 9.25 |
| Brass, light | 6.00 | 5.50 | 6.00 |
| No. 1 yellow brass turnings | 6.50 | 7.00 | 7.00 |
| Zinc | 3.00 | 4.00 | 4.25 |

**TIN PLATES**—American Charcoal Plates—Bright—Cents per lb.

| | | New York | Cleveland | Chicago |
|---|---|---|---|---|
| "AAA" Grade: | | | | |
| IC, | 20x28, 112 sheets | 20.00 | 18.25 | 18.50 |
| IX, | 20x28, 112 sheets | 23.00 | 21.00 | 20.90 |
| "A" Grade: | | | | |
| IC, | 20x28, 112 sheets | 17.00 | 16.00 | 17.00 |
| IX, | 20x28, 112 sheets | 20.00 | 18.75 | 19.60 |
| Coke Plates, Bright | | | | |
| Prime, 20x28 in.: | | | | |
| 100-lb., | 112 sheets | 12.50 | 11.00 | 14.50 |
| IC, | 112 sheets | 12.80 | 11.40 | 14.80 |
| Terne Plate | | | | |
| Small lots, 8-lb. Coating: | | | | |
| 100-lb., | 14x20 | 7.00 | 6.00 | 7.25 |
| IC, | 14x20 | 7.25 | 6.25 | 7.40 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb. | $0.09@$0.11½ | $0.12 | $0.11½ |
| Cotton waste, mixed, per lb. | .065@.10 | .09 | .08 |
| Wiping cloths, 13½x13½, per lb. | .075 | .06 | .10 |
| Wiping cloths, 13½x20½, per lb. | .08 | .096 | .13 |
| Sal soda, 100 lb. lots | 2.80 | 2.40 | 2.65 |
| Roll sulphur, per 100 lb. | 2.85 | 3.25 | 3.50 |
| Linseed oil, per gal., 5 bbl. lots | .91 | 1.01 | .97 |
| White lead, dry or in oil | 100 lb. kegs. | New York, 12.75 | |
| Red lead, dry | 100 lb. kegs. | New York, 12.75 | |
| Red lead, in oil | 100 lb. kegs. | New York, 14.25 | |
| Fire clay, per 100 lb. bag | | .80 | 1.00 |
| Coke, prompt furnace, Connellsville | per net ton | 12.00 | |
| Coke, prompt foundry, Connellsville | per net ton | 13.50@14.00 | |

## SHOP SUPPLIES

Current Discounts from Standard Lists

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Machine Bolts: | | | |
| All sizes up to 1x30 in. | 40% | 60% | 50% |
| 1½ and 1¼x3 in. up to 12 in. | 20% | 50% | 50% |
| With cold punched sq. nuts | 25% | $3.50 net | .... |
| With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%) | 30% | 3.50 net | $4.00 off |
| Button head bolts, with hex. nuts | 15% | 3.90 net | ..... |
| Hex. head and hex. nut bolts | 20% | ..... | 65-5% |
| Lag screws, coach screws | 40% | ..... | 60-5% |
| Square and hex. head cap screws | 70% | 70% | 70-10% |
| Carriage bolts, up to 1 in. x 30 in. | 30% | 50–10–5% | 45% |
| Bolt ends, with hot pressed nuts | 40% | ..... | 55% |
| Tap bolts, hex. head, list plus | 20% | ..... | ..... |
| Semi-finished nuts ⅝ and larger | 60% | 70% | 80% |
| Case-hardened nuts | 50% | ..... | ..... |
| Washers, cast iron, ½ in., per 100 lb. (net) | $6.00 | $3.50 | $3.50 |
| Washers, cast iron, ⅝ in. per 100 lb. (net) | 4.50 | 3.25 | 3.50 |
| Washers, round plate, per 100 lb. Off list | 3.00 | 5.00 | 3.50 net |
| Nuts, hot pressed, sq., per 100 lb. Off list | 1.00 | 3.50 | 4.00 |
| Nuts, hot pressed, hex., per 100 lb. Off list | 1.00 | 3.50 | 4.00 |
| Nuts, cold punched, sq., per 100 lb. Off list | 1.00 | 3.50 | 4.00 |
| Nuts, cold punched, hex., per 100 lb. Off list | 1.00 | 3.50 | 4.00 |
| Rivets: | | | |
| Rivets, 7/16 in. dia. and smaller | 45% | 60% | 60% |
| Rivets, tinned | 50% | 60% | 4½c. net |
| Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net) | $5.00 | $3.50 | $3.35 |
| Cone heads, ditto (net) | 5.10 | 3.60 | 3.45 |
| 1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb | 0.25 | ..... | 0.15 |
| ⅝ in. diameter *EXTRA* | 0.15 | ..... | 0.15 |
| ½ in. diameter *EXTRA* | 0.50 | ..... | 0.50 |
| 1 in. long, and shorter *EXTRA* | 0.50 | ..... | 0.50 |
| Longer than 5 in. *EXTRA* | 0.25 | ..... | 0.25 |
| Less than 200 lb. *EXTRA* | 0.50 | ..... | 0.50 |
| Countersunk heads *EXTRA* | 0.35 | ..... | $3.70 base |
| Copper rivets | 55–5% | 50% | 50% |
| Copper burs | 35% | 50% | 20% |

| | | | |
|---|---|---|---|
| Lard cutting oil (50 gal. bbl.) per gal. | $0.55 | $0.50 | $0.67½ |
| Machine lubricant, medium-bodied (50 gal. bbl.), per gal. | 0.33 | 0.35 | 0.40 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls). | | | |
| Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88: | | | |
| Medium grade | 40–5% | 40½% | 50% |
| Heavy grade | 30–5% | 30–5% | 40–5% |
| Rubber and duck: | | | |
| First grade | 60–5% | 50–10% | 40-10% |
| Second grade | 60–10–5% | 60–5% | 60–5% |
| Abrasive materials—In sheets 9x11 in.: | | | |
| No. 1 grade, per ream of 480 sheets, Flint paper | $5.84 | $5.84 | $6.48 |
| Emery paper | 8.80 | 11.00 | 8.80 |
| Emery cloth | 27.84 | 31.12 | 29.48 |
| Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, | 4.50 | 4.28 | 4.95 |
| Emery discs, 6 in. dia., No. 1 grade, per 100. | | | |
| Paper | 1.32 | 1.24 | 1.40 |
| Cloth | 3.02 | 2.67 | 3.20 |

# New and Enlarged Shops

## Machine Tools Wanted

**Ariz., Superior**—Magma Copper Co.—shaper, vertical drill, power hacksaw, pipe threading machine, bolt machine and wet and dry grinder.

**Mass., Boston**—A. T. Stearns, 53 Merrimac St. (sheet metal worker)—foot punch press, circular power shears and electric drill (used).

**Mich., Detroit**—Standard Gear Co., 2821 Brooklyn Ave.—additional gear cutting machinery.

**Mo., Kansas City**—R. Connor, 1821 McGee St., (machine shop)—electric drill.

**Mo., Kansas City**—The Standard Steel Wks., 16th and Holmes Sts.—pipe bending machine.

**N. J., Jersey City**—W. W. Kellogg, 117 Westside Ave. (pipe-fittings)—shop equipment, including lathes, drill presses and planers for addition to plant.

**N. Y., Bemus Point**—J. B. White—machinery, tools and equipment for proposed garage and service station.

**N. Y., Buffalo**—W. D. McGuire, 1479 Hertel Ave.—machinery, tools and equipment for proposed garage and repair shop.

**N. Y., Rochester**—C. Cunningham, 52 Hamilton St.—machinery, tools and equipment for garage and repair shop.

**O., Dayton**—Dayton Power & Light Co., 4th and Jefferson Sts.—machine shop equipment for plant at Millers Ford.

**Pa., Bradford**—The Gun Shop, 18 Chambers St.—one small lathe, foot or motor driven.

**Pa., Eau Claire**—W. H. Burkett—machinery, tools and equipment for garage and repair shop, to replace that which was destroyed by fire.

**Pa., New Castle**—Fowler Radiator & Mfg. Co., (manufacturer of radiators, boilers, etc.), E. L. Brundage, Mgr.—machinery and equipment for proposed addition to factory.

**Pa., Oil City**—E. M. Bowen—machinery, tools and equipment for proposed automobile repair and service station.

**Pa., Scranton**—T. F. Leonard Estate, 505 Lackawanna Ave.—mechanical equipment, tools, etc., for proposed garage on Adams Ave.

**Pa., West Fairview**—Holmes Garage Co.—machinery, tools and equipment to replace that which was recently destroyed by fire.

**Va., Richmond**—Chesterfield Motor Co., 19 Petersburg Pike—automobile repair machinery, incl. drill press and lathe.

**Va., Richmond**—J. L. Cottrell, 4024 Williamsburg Ave., (automobile repairs)—shaper, drill press and lathe.

**Va., Richmond**—H. L. Grow, 1 Midlothian Pike, (automobile repairs)—expansion reamer.

**Va., Richmond**—Kersey Motor Co., 1800 Decature St.—automobile repair machinery, including lathe, press, etc.

**Va., Richmond**—L. M. Walton, 3827 8th St. (automobile repairs)—lathe, drill press and burning in machine.

**Wis., Monroe**—The United Telephone Co., R. M. Austin, Mgr.—automobile repair machinery for proposed garage.

**Wis., Sheboygan Falls**—Wisconsin Regrinding Co., A. P. Schneidewind, Pres.—machinery for cylinder and crank shaft grinding and mill repair work, for proposed machine shop at Rhinelander.

**Wis., Wisconsin Rapids**—R. A. Ebbe—automobile repair machinery.

**Ont., London**—Middlesex Motors, Ltd., 781 Dundas St., F. B. Isaacs, Mgr.—complete equipment for proposed automobile service station and repair shop.

**Que., Montreal**—Red Star Refineries Ltd., Canada Cement Bldg., M. Chatfield, Ch. Engr.—1,250 bbl., 5,000 bbl., 10,000 bbl., 25,000 bbl., 55,000 bbl. and 80,000 bbl. storage tanks, 10 x 30 ft. station tanks, agitators, miscellaneous small tanks, 10 x 30 ft. and 10 x 40 ft. stills, pipe stills, preheaters, exchangers for vapor and liquid, coolers, towers, condensers, pumps, compressors, machine tools and machinery.

## Machinery Wanted

**Calif., San Pablo**—San Pablo Pottery Co., Inc.—machinery and equipment for proposed addition to works, including large kilns and presses (new).

**Colo., Denver**—Denver Custom Garment Co., 1517 Lawrence St., A. Johnson, Purch. Agt.—machinery for proposed factory.

**Ill., Chicago**—J. Drexler, 2263 Marmora Ave., (machinist)—air compressor, Gardner Rix, 2 stage, preferred.

**Ill., Kankakee**—The Kankakee Daily Republican—linotype, (No. 5 preferred).

**Ill., Salem** — The Republican, (newspaper)—one 30 in. power paper cutter.

**Ind., Orland**—A. D. Wells, (job printer)—one 25 to 28 in. power paper cutter.

**Kan., Lincoln Center** (Lincoln P. O.)—Brice Printing Co., O. A. Brice, Purch. Agt.—automatic press and a 32 in. paper cutter.

**Kan., Wichita**—J. W. Krebs, 341 North Millwood Ave. (planing mill)—belting, hangers, band saw and shafting.

**Kan., Wichita**—Peoples Finance Co., 124 East First St.—lumber saw mill, belting, band saw, log saw and other lumber equipment.

**Mass., Southbridge** — Hamilton Woolen Co.—machinery for addition to plant.

**Mich., Detroit**—Printers' Exchange, 2325 Grand River Ave.—power presses, 8 x 12 in. and 12 x 18 in.

**Mich., Detroit** — O. B. Whipple, 8011 Woodward Ave.—paper cutter, press and equipment for small print shop.

**Minn., Bemiji** — Minnesota Associated Lumber Co.—machinery for proposed lumber mill.

**Minn., Minneapolis**—The Star Laundry, 906 Hennepin Ave., G. M. Carter, Pres.—additional machinery and equipment for proposed laundry.

**Minn., Monticello**—Monticello Creamery Assn., A. H. Lauterbach, Secy.—complete set of equipment for new creamery, incl. 2 ripeners, one churn, one refrigerating machine, pumps, etc.

**Neb., Lincoln**—V. M. McVey, Brownell Bldg.—power presses, 10 x 15 in. and 12 x 18 in.

**Neb., Nebraska City**—The Press Printing Co.—wire stitcher, No. 5, either Boston or Monitor make.

**N. H., Harrisville**—Cheshire Mills (manufacturers of woolen goods)——machinery for addition to plant.

**N. Y., Albany** — The State Hospital Comn., receiving bids until Oct. 11 for additional laundry equipment for Utica State Hospital, Utica.

**N. Y., Brooklyn**—Rubel Coal & Ice Corp., Glenmore Ave.—ice making machinery for proposed plant.

**N. Y., Buffalo**—Angola Tire & Rubber Co., 270 North Division St.—machinery and equipment for proposed addition to factory.

**N. Y., Buffalo**—M. Lewis, 580 Ellicott Sq.—machinery and equipment for vinegar and pickle plant.

**N. Y., Buffalo**—W. Maynard Co., 17 Newell St.—equipment for abbatoir.

**N. Y., Cheektowaga** (Buffalo P. O.)—Live Poultry Transit Co., Bway.—machinery and equipment for proposed fertilizer and car repair plant at Forks.

**N. Y., Elma Center**—J. Geyers—equipment for blacksmith shop to replace that which was destroyed by fire.

**N. Y., Jamestown**—Herby Bros., 610 West 7th St.—additional mechanical equipment for proposed addition to wagon and automobile truck body factory and shop.

**N. Y., Jamestown**—Jamestown Chair Factory, 20 Winsor St.—woodworking machinery and equipment for proposed addition to factory.

**N. Y., New York** — Bd. of Purchase, Municipal Bldg.—receiving bids until Oct. 11 for laundry machinery.

**N. Y., New York**—Superior Ice Co., Inc., 50 East 42nd St.—ice making machinery for new plant at Sheepshead Bay.

**N. Y., Oswego**—Tioga Milk Producers' Assn.—machinery and equipment for new creamery and milk plant.

**N. Y., Rochester**—Electric Storage Battery Co., 181 South Clinton St.—machinery and equipment for proposed storage battery and products factory.

**N. Y., Rome**—Rome Wire Co., Railroad Ave.—machinery and equipment for proposed plant for the manufacture of cable wire, at Niagara Falls, Ont.

**N. C., Speed**—Edgecombe County School Bd.—vocational equipment for new school at Crisp.

**O., Blanchester**—Fulflo Specialties Co.—one belt driven, modern air compressor, 100 to 350 ft. at 100 lb. pressure.

**O., Cleveland**—G. T. Marks, 2197 East 82nd St.—woodworking machinery for pattern shop.

**O., Columbus**—General Fixture & Supply Co., 61 East Spring St. (manufacturer of refrigeration machinery), E. L. Farmer, Genl. Mgr.—woodworking machinery, including one groover, 2 planers, several drills, etc

**O., Delaware** — Sterling Stone & Lime Co., J. T. Herrick, Genl. Mgr.—machinery and equipment for proposed stone crushing plant, capacity 1,200 ton per day.

**O., Middletown**—Gardner-Harvey Paper Co.—machinery and equipment for proposed $150,000 addition to factory.

**O., Ravenna**—W. Sidevan, Coats Bldg.—one 8 x 12 in. and one 7 x 11 in. press, also other printshop equipment.

**O., Warren**—G. N. Anthony, 515 South Austin St.—5 ton wagon and truck scales.

**Okla., Oklahoma City**—Tower Gasoline Co., 212 Mercantile Bldg.—machinery and equipment for proposed addition to refinery at Blackwell, and also for proposed refinery and gasoline plant.

**Pa., Beaver Falls**—B. Keefer, 21st St. and 5th Ave.—machinery and equipment for carpenter and pattern shop.

**Pa., Bellefonte**—R. Smith—machinery and equipment for proposed addition to ice cream plant, 600 gal. capacity.

**Pa., Bradford**—A. Gillis, 1 Mechanic St.—engine and power machinery outfit for pumping two oil wells.

**Pa., Clarion**—Berney-Bond Glass Co.—machinery and equipment for proposed glass factory.

**Pa., Easton**—C. K. Williams & Co., (manufacturer of dry colors)—one rotary kiln, 8 ft. in diam. and about 85 ft. long, Vulcan type.

**Pa., Kinzua**—E. G. Anderson—machinery and equipment for sawmill to replace that which was destroyed by fire.

**Pa., Lititz**—The Stiffel & Freeman Co., Inc. (manufacturers of locks, safes, vaults, etc.)—machinery and equipment for proposed one story addition to factory.

**Pa., Phila.**—M. J. Hunt's Sons Co., 251 Richmond St., (steel fabricators)—double drum electric hoist, 5 ton capacity.

**Pa., Phila.**—Manyunk Plush Mfg. Co., 108 Levering St.—additional looms for proposed mill.

**Pa., Phila.**—Pennsylvania R.R., Broad St. Sta., M. Smith, Purch. Agt.—two 250 ton, six 15 ton, one 50 ton, two 25 ton and two 60 ton cranes.

**Pa., Pittsburgh**—W. H. Ritenour, 1315 West Liberty Ave. (job printers)—stereotype steam table.

**Pa., Wilkes-Barre**—The Candlemas Collieries Co., 713 Coal Exchange Bldg., N. Chrisman, Solicitor—machinery and equipment for mining, preparing and shipping of coal.

**Pa., Williamsport**—Demarset Silk Co., 606 Railway St.—machinery and equipment for proposed addition to silk factory.

**Tenn., Chattanooga** — Signal Mountain Mining Co., L. S. Berg, Genl. Mgr.—hoisting and conveying machinery and other equipment for development of coal properties in Suck Creek field.

**Tenn., Nashville**—Douglas Coal Mining Co., 504 Fourth and First National Bank Bldg., A. Lackel, Pres.—hoisting equipment, electrical machinery, dump cars, mine locomotives and other equipment for

development of coal mining properties near Island, Ky.

**Tex., Galveston**—Goliad School, 31st and L Sts., A. Brown, Purch. Agt.—complete line of tools for vocational school work.

**Va., Richmond**—L. R. Kelly, 215 East Marshall St.—battery charging outfit.

**Va., Richmond**—W. F. Lipford, 602 State St.—printing presses.

**W. Va., Nitro**—Nitro Pencil Co.—machinery to replace that which was destroyed by fire.

**Wis., Colby**—Colby Buick Co., c/o H. J. Cornelius—air tank and gas storage tank with pump.

**Wis., Menomonie**—Boothby Print Shop—No. 14 linotype.

**Wis., North Milwaukee**—North Milwaukee Fdry. Co., Commerce Ave.—cupola (new).

**Wis., Milwaukee**—A. C. Beck Co., 1 East St.—woodworking machinery, including band saws.

**Wis., Potosi** — Tennyson Co-operative Creamery Co., J. H. Schafer, Pres.—dairy machinery

**Wis., Reeseville**—The Reeseville Canning Co.—canning and conveying machinery, belting, shafting and hangers for proposed factory at Clyman.

**Wis., Sheboygan**—City Upholstering Co., 1542 Silbey Court, W. E. Ahrens, Mgr.—machinery for upholstering furniture.

**Wis., Stevens Point**—Stevens Point Cleaning & Dye Wks., 446 Clark St.—dyeing and cleaning machinery and equipment for proposed plant (new).

**Wyo., Glenrock**—Mutual Oil Co.—machinery and equipment for proposed addition to refineries here and at Cowley.

**Ont., Paris**—Penmans, Ltd.—machinery and equipment for the manufacture of woolen underwear.

**Ont., Sarnia**—Mueller Mfg. Co., H. Burleigh, Mgr.—machinery for the manufacture of special lines of plumbing goods, for proposed addition to plant.

**Ont., Toronto** — Surgis Baby Carriage Co., 60 Sumach St.—machinery and equipment for proposed factory at Brampton.

## Metal Working Shops

**Conn., Norwalk**—The E. M. Jennings Co., 27 Harrison St., Bridgeport, awarded the contract for the construction of a 1 story, 55 x 155 ft. garage and service station, on West Ave., here. Estimated cost $40,000. Noted Aug. 29.

**Ill., Elgin**—F. D. Chase, Inc., Archt., 645 North Michigan Ave., Chicago, are receiving bids for the construction of a 3 story factory, on State and Schiller Sts., here, for Elgin Stove & Oven Co., 14 Chicago St. Estimated cost $100,000.

**Ill., LaGrange**—Fugard & Knapp, Archts., 212 East Superior Ave., Chicago, are receiving bids for the construction of a 1 story, 70 x 160 ft. garage, here, for Fleck & Buchholtz, 19 West Railroad St., Downers Grove. Estimated cost $50,000.

**Ind., Alexandria** — Ziegler Mfg. Co., manufacturer of metal stampings and screw machine products, is building a 1 story, 60 x 200 ft. addition to its factory.

**Ind., Indianapolis**—Indiana Battery Service Co., 1007 North Meridian St., is having plans prepared for the construction of a 1 story, 60 x 200 ft. automobile service station. Estimated cost $30,000. F. S. Cannon, 21 Virginia Ave., Archt.

**Ind., Indianapolis**—Rockwood Mfg. Co., 1801 English Ave., is having plans prepared for the construction of two 1 story machine shops, 100 x 200 ft. and 75 x 100 ft. Estimated cost $40,000. Mothershead & Fitton, 540 North Meridian Ave., Archts.

**Ind., Richmond**—Automotive Gear Co. is receiving bids for the construction of a 1 story, 400 x 600 ft. gear factory, on 8th St. Estimated cost $35,000. J. A. Mueller, Archt. Noted Sept. 7.

**Ia., Des Moines**—E. W. Nothstine is having plans prepared for the construction of a 6 story, 127 x 264 ft. garage, on 5th and Chestnut Sts. Estimated cost $300,000. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Archts.

**Mass., Great Barrington** — Whalen & Kastner awarded the contract for the construction of a 1 story, 70 x 140 ft. garage and service station. Estimated cost $42,000.

**Mass., Roxbury** (Boston P. O.)—The Albert Griffiths Saw Co., 30 Whittier St., plans to build a 1 story, 40 x 90 ft. addition to its factory, on Columbus Ave. Estimated cost $20,000. Private plans.

**Mich., Dearborn**—Ford Motor Co., Highland Park, has had plans prepared for the construction of a 1 story, 200 x 800 ft. experimental laboratory. A. Kahn, 1000 Marquette Bldg., Detroit, Engr.

**Mich., Holland**—Bd. Educ. is having plans revised for the construction of a 3 story, 110 x 160 ft. high school, including manual training department, laboratories, printing and machine shops, etc., on River Ave. Estimated cost $250,000. B. Parks & Son, Grand Rapids, Engrs. Robinson-Campau, 715 Michigan Trust Bldg., Grand Rapids, Archts.

**Mich., Lansing**—The Y. M. C. A., West Michigan St., is having preliminary plans prepared for the construction of a 5 story, 50 x 120 ft. building, including swimming pool, gymnasium, machine shop, etc., on West Allegan St. Estimated cost $400,000. J. Wilson, Secy. N. McMillan, 348 Madison Ave., New York City, Archt.

**Minn., Buhl**—The Hanna Ore Mining Co., 909 Fidelity Bldg., Duluth, awarded the contract for the construction of a 2 story, 80 x 106 ft. machine shop, a 2 story, 38 x 124 ft. warehouse and office building, a 1 story, 24 x 52 ft. garage, and a 2 story, 20 x 20 ft. oil house, at the Wabigon Mine, here. Estimated cost $115,000.

**Mo., Kansas City**—White Co., 2001 Grand Ave., awarded the contract for the construction of a 2 story, 100 x 250 ft. garage and sales building on 29th and Walnut Sts. Estimated cost $100,000.

**N. J., Newark**—Dept. of Streets and Public Improvements, City Hall, is preparing plans for the construction of a 2 story, 70 x 150 ft. addition to its garage on Franklin St. Estimated cost $175,000. Private plans.

**N. Y., Bemus Point**—J. B. White is having plans prepared for the construction of a 2 story garage and service station. Cost will exceed $40,000. Johnson & Ford, Fenton Bldg., Jamestown, Archts.

**N. Y., Buffalo**—Klepfer Bros., 1029 Main St., are receiving bids for the construction of a 2 story, 235 x 570 ft. automobile service and repair station. A. H. Hopkins, 447 Main St., Archt.

**N. Y., New York**—Dept. of Water Supply, Gas and Electricity, Municipal Bldg., plans to build a garage on East 24th St. and Ave. A. Estimated cost $50,000. Private plans.

**O., Cincinnati**—The J. A. Fay & Egan Co., John and Front Sts., is having revised plans prepared for the construction of a 1, 2 and 3 story machine shop with about 80,000 sq.ft. of floor space, on Paddock Rd. and Tennessee Ave. Estimated cost $400,000. C. M. Stegner, Archt. and Engr.

**O., Cleveland**—The Grabler Mfg. Co., 6565 Bway., manufacturer of automobile accessories, is having plans prepared for the construction of a 2 story, 60 x 160 ft. addition to its factory at 1401 East 40th St. Estimated cost $60,000. C. H. Foster, 1401 East 40th St., Mgr. H. E. Shimmin, 2031 Euclid Ave., Archt.

**O., Cleveland**—West Center Sales Co., West 30th St. and Lorain Ave., awarded the contract for the construction of a 2 story, 50 x 130 ft. garage. Estimated cost $40,000.

**Pa., Manor**—Amer. City Eng. Co., Peoples Bank Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 110 x 130 ft. machine shop and a 30 x 65 ft. foundry, here, for the Robertshaw Mfg. Co., Youngwood.

**Pa., Monongahela**—Keystone Garage is receiving bids for the construction of a 2 story, 60 x 200 ft. garage and service station. Estimated cost $50,000. C. K. Downer, 248 Boylston St., Boston, Mass., Archt. Noted Sept. 21.

**Pa., Oil City**—E. M. Bowen is receiving bids for the construction of a 3 story, 70 x 80 ft. automobile repair and service station. Estimated cost $45,000. W. H. Crosby, Masonic Bldg., Archt. Noted Sept. 28.

**Pa., Phila.**—The General Electric Co., River Rd., Schenectady, N. Y., is receiving bids for the construction of a 7 story, 140 x 175 ft. addition to its switch factory, on 7th St. and Willow Ave., here. Private plans.

**Pa., Phila.**—The Traylor Eng. Co., Broad St. and Lehigh Ave., awarded the contract for the construction of an 8 story, 124 x 205 ft. automobile factory. Estimated cost $455,000.

**Pa., Pitcairn**—Pennsylvania R.R., Broad St. Sta., Phila., will soon award the contract for the construction of a 62 x 107 ft. paint storage and airbrake shop, a 40 x 200 ft. rivet cutting building, a 103 x 424 ft. paint shop and bake oven, a 100 x 760 ft. freight car repair shop, a 14 x 26 ft. oil house, a 43 x 203 ft. store house and welfare building and a 16 x 31 ft. oxygen and acetylene storage building, all one story, here. Estimated cost $500,000. A. C. Shand, Broad St. Sta., Phila., Ch. Engr.

**Pa., Pittsburgh**—Hanlon Gregory Galvanizing Co., 24th St., is having plans prepared for the construction of a 1 story, 100 x 400 ft. factory, on 56th and Butler Sts. Estimated cost $100,000. J. E. Dwyer, Forbes Murray Bldg., Archt.

**Pa., Scranton**—T. F. Leonard Estate, 505 Lackawanna Ave., will receive bids about Nov. 1 for the construction of a 2 story, 80 x 130 ft. garage on Adams Ave. Estimated cost $40,000. Architect not announced.

**R. I., Providence**—Colvin Fdry. Co., 185 Globe St., awarded the contract for the construction of a 1 story, 100 x 100 ft. addition to its foundry. Estimated cost $75,000.

**R. I., Providence**—The Olneyville Realty Co., Inc., 18 Plainfield St., plans to build a 1 story garage and service station, with capacity for 70 cars. Estimated cost $40,000. Architect to be announced later.

**Tenn., Knoxville**—The Mahan-Kerr Motor Co., Market St., is having plans prepared for the construction of a 3 story, 90 x 100 ft. showroom and garage on Market and Cumberland Sts. Estimated cost $150,000. Barber & McMurry, Burnwell Bldg. Engrs. and Archts.

**Wis., Colby**—Colby Buick Co., c/o H. J. Cornelius, plans to build a 2 story, 50 x 80 ft. garage. Estimated cost $40,000. Architect not selected.

**Wis., Milwaukee**—The Luick Ice Cream Co., 183 Ogden St., is having preliminary plans prepared for the construction of a 2 story, 120 x 120 ft. garage, on Van Buren St. Estimated cost $75,000. Leenhouts & Guthrie, 424 Jefferson St., Archts.

**Wis., Milwaukee**—E. G. Schroeder Co., Engrs. and Archts., 405 Bway., is receiving bids for the construction of a 1 story, 130 x 150 ft. factory and office building, on Keefe Ave., for Milwaukee Air Power Pump Co., 886 3rd St.

**Wis., Monroe**—The United Telephone Co. plans to build a 2 story, 40 x 65 ft. garage, etc. Estimated cost $40,000. R. M. Austin, Mgr. Private plans.

**Wis., North Milwaukee**—The North Milwaukee Fdry. Co., Commerce Ave., plans to build a 1 story, 50 x 150 ft. foundry, to replace the one which was recently destroyed by fire.

**Wis., Racine**—**F. J.** Greene Eng. Wks., 1028 Douglas Ave., is having plans prepared for the construction of a 3 story, 53 x 100 ft. factory. Estimated cost $50,000. E. B. Funston Co., 503 Robinson Bldg., Archt.

**Wis., Racine**—Jacobson Auto Co., 1820 West 6th St., awarded the contract for the construction of a 2 story, 60 x 120 ft. garage. Estimated cost $40,000. Noted March 30.

**Wis., Rhinelander**—Wisconsin Regrinding Co., Sheboygan Falls, plans to build a 1 story, 50 x 90 ft. machine shop, here. Estimated cost $40,000. A. P. Schneidewind, Pres. Architect not selected.

**Ont., London**—Middlesex Motors, Ltd., 781 Dundas St., will receive bids Oct. 16 for the construction of a 75 x 200 ft. automobile service station and repair shop. Estimated cost $55,000. F. B. Isaacs, Mgr.

**Ont., Niagara Falls**—Rome Wire Co., Railroad Ave., Rome, N. Y., plans to build a 2 story, 40 x 250 ft. factory, here, for the manufacture of cable wire. Cost will exceed $75,000. Architect not announced.

**Ont., St. Thomas**—The Windsor Machine & Tool Co., 312 Pitt St., Windsor, plans to build a plant, here, for the manufacture of pistons and piston rings. Estimated cost $100,000.

**Ont., Sarnia**—Mueller Mfg. Co. plans to build an addition to its plant for the manufacture of special lines of plumbing goods. Estimated cost $100,000. H. Burleigh, Mgr.

## General Manufacturing

**Ala., Birmingham**—Lehigh Portland Cement Co., Young Bldg., Allentown, Pa., plans to build a large plant on tract near here, with a capacity of 1,000,000 bbl. per year.

**Calif., Petaluma**—Poultry Producers of Central California, 323 East Washington St., will have plans revised for the construction of a 110 x 210 ft. packing plant. Noted Sept. 28.

**Calif., Sacramento**—The State of California awarded the contract for the construction of a 2 story, 160 x 160 ft. printing plant on 11th and O Sts. Estimated cost $94,800. Noted Aug. 29.

**Calif., San Francisco**—Ferro Bros., 2823 23rd St., have had plans prepared for the construction of a 2 story, 25 x 104 ft. addition to their bakery. C. Fantoni, 550 Montgomery St., Archt.

**Calif., San Francisco**—Millbrae Dairy, 834 Octavia St., is having plans prepared for the construction of a 2 and 3 story dairy, on McAllister St. near Laguna St. Estimated cost $100,000. J. Reid, Jr., First National Bank Bldg., Archt.

**Conn., Stamford** — Emmens & Abbott, Archts., Washington Bldg., are receiving bids for the construction of a 3 story, 75 x 100 ft. factory, for the manufacture of clothing, on Beckley Ave., for S. and J. Gruber, 544 Main St. Estimated cost $60,000.

**Ga., Savannah**—Western Paper Makers Chemical Co., River Rd., Kalamazoo, Mich., plans to build a paper mill, here. Estimated cost $500,000.

**Ill., Chicago**—Amer. Casket & Mfg. Co., 1317 West Division St., awarded the contract for the construction of a 3 story, 25 x 70 ft. addition to its factory. Estimated cost $30,000.

**Ill., Chicago**—The Enterprise Parlor Furniture Co., 2315 West Huron St., awarded the contract for the construction of a 3 story, 100 x 125 ft. addition to its factory. Estimated cost $50,000. Noted Sept. 14.

**Ill., Chicago**—Florence Art Co., c/o Minchin Spitz & Co., Archts., 19 West Jackson St., awarded the contract for the construction of a 4 story, 50 x 108 ft. factory for the manufacture of art lamps, on North California and George Sts. Estimated cost $125,000.

**Ill., Chicago**—Illinois Publishing Co., 327 West Madison St., awarded the contract for the construction of a 3 story, 125 x 240 ft. printing plant on 26th and LaSalle Sts. Estimated cost $500,000.

**Ind., Evansville**—General Cigar Co., Upper 2nd St., plans to construct a 4 story, 75 x 150 ft. cigar factory. Estimated cost $75,000. A. E. Neucks, Peoples Bank Bldg., Archt.

**Ind., Hammond**—Hammond Dairy Co. is having plans prepared for the construction of a 2 story, 53 x 70 x 153 ft. dairy building on Oakley St. Estimated cost $100,000. A. C. Berry & Co., Ruff Bldg., Archts.

**Ind., Princeton**—Tip Top Creamery Co. plans to build a 2 story creamery. Estimated cost $30,000. Architect not selected.

**Ind., Richmond**—Consumers Service Co. plans to build a 1 story refinery, will require 5 tanks of 100,000 gal. capacity. Estimated cost $200,000. Architect not selected.

**Kan., Atchison**—Blair Milling Co., 300 South 4th St., is receiving bids for the construction of a 6 story, 36 x 83 ft. flour mill. Horner & Wyatt, 306 McMillan Bldg., Kansas City, Mo., Archts.

**Kan., Salina**—H. D. Lee Flour Mills Co. awarded the contract for the construction of a cleaner house, temping bins, elevator, 8 tanks, 22 ft. diameter, capacity 300,000 bu. Estimated cost $190,000. Noted Aug. 24.

**Me., Dexter**—A. Abbott Co., manufacturer of woolens, plans to rebuild its 2 story plant which was recently destroyed by fire. Estimated cost $100,000.

**Mass., Clinton**—Lancaster Mills, 1 Green St., awarded the contract for the construction of a 1 story, 20 x 180 ft. addition to its woolen mill. Estimated cost $25,000.

**Mass., Dorchester** (Boston P. O.)—Liberty Marble Co. 80 Granite St., South Boston, will build a 1 and 2 story, 80 x 122 ft. marble shop, on Dillingham St. Estimated cost $25,000.

**Mass., East Braintree**, (Boston P. O.)—Massachusetts Oil & Refining Co., 209 Washington St., Boston, plans to build an oil separator plant on Quincy Ave., here. Estimated cost $50,000. Private plans.

**Mass., Millbury**—The Felters Co., West St., manufacturers of felt, plans to build a 1 story dyehouse. Private plans.

**Mass., Northampton**—Pomeroy Bros., 254 Pleasant St., awarded the contract for the construction of a 2 story, 60 x 80 ft. woodworking factory. Estimated cost $25,000.

**Mass., Springfield**—Victor-Wright-Ditson Co., Birnie Ave., awarded the contract for the construction of a 2 story, 60 x 150 ft. addition to its factory, for the manufacture of sporting goods. Estimated cost $12,000.

**Mass., Worcester**—Waldorf System, Inc., 169 High St., Boston, is having plans prepared for the construction of a 1 story bakery, etc., on Arch and Summer Sts., here. Estimated cost $40,000. J. M. Gray, 112 Water St., Boston, Archt.

**Mich., Detroit**—Kroger Grocery & Baking Co., 817 Main St., Cincinnati, O., awarded the contract for the construction of a 2 and 3 story, 203 x 424 ft. bakery and warehouse on Merritt Ave., here.

**Mich., Three Oaks**—The Warren Featherbone Co. has had plans prepared for the construction of a 2 story, 68 x 140 ft. factory. Estimated cost $45,000. G. W. Allen, Laporte, Ind., Archt.

**Minn., Bemidji** — Minnesota Associated Lumber Co. plans to build a large lumber mill for cutting and preparing 40,000,000 ft. of birch timber. Estimated cost $500,000. Architect not announced.

**Minn., Chisholm**—Bd. Educ. will receive bids about Dec. 1, for the construction of a 3 story junior high school, including manual training and industrial departments. Estimated cost $750,000. E. Drew, Clk. German & Jensen, Exch. Bank Bldg., Duluth, Archts.

**N. Y., Batavia**—P. W. Minor & Son, Inc., awarded the contract for the construction of a 4 story, 43 x 140 ft. addition to their shoe factory, on State St. Estimated cost $100,000.

**N. Y., Brooklyn** — The United Last Co., 191 Worth St., New York City, awarded the contract for the construction of a 3 story, 80 x 131 ft. and a 1 story, 16 x 50 ft. additions on Classon Ave. and Clifton Pl., here.

**N. Y., Brooklyn**—The Rubel Coal & Ice Corp., Glenmore Ave., will build an ice plant on Atlantic Ave. Estimated cost $500,000. E. M. Adelsohn, 1778 Pitkin Ave., Engr.

**N. Y., Buffalo**—Angola Tire & Rubber Co., 270 North Division St., awarded the contract for the construction of a 1 story, 30 x 80 ft. addition to its factory. Cost will exceed $5,000.

**N. Y., Buffalo** — W. Maynard Co., 17 Newell St., plans to build a 2 story, 50 x 100 ft. abbattoir. Estimated cost $40,000. Architect not announced.

**N. Y., Forks**—The Live Poultry Transit Co., Bway., Cheektowaga (Buffalo P. O.), plans to rebuild its fertilizer and car repair plant, here, which was destroyed by fire. Estimated cost $100,000. Architect not selected.

**N. Y., Jamestown**—Herby Bros., 610 West 7th St., plan to build an addition to their wagon and automobile truck body factory and shop. Estimated cost $5,000. Private plans.

**N. Y., Jamestown** — Jamestown Chair Factory, 20 Winsor St., plans to build a 4 story, 50 x 67 ft. addition to its factory. Estimated cost $20,000. Architect not announced.

**N. Y., Jamestown**—Jamestown Worsted Mills Co., 335 Harrison St., is having plans prepared for the construction of a 4 story, 70 x 180 ft. factory (No. 16). Estimated cost $250,000. Lockwood, Greene & Co., 1556 Hanna Bldg., Cleveland, O., Archts. and Engrs.

**N. Y., North Tonawanda** — The Auto Wheel Coaster Co., manufacturer of coaster wagons and sleds, plans to rebuild portion of its factory, on Schenk St., which was destroyed by fire. Estimated cost $25,000. Architect not announced.

**N. Y., Rochester**—Don-O-Lak Co. plans to rebuild portion of its paint and varnish factory which was destroyed by fire. Estimated cost $50,000. Architect not announced.

**N. Y., Sheepshead Bay** (Brooklyn P. O.)—Superior Ice Co., Inc., 50 East 42nd St., New York City, is having plans prepared for the construction of an ice plant, on Ave. Z and East 17th St., here. Estimated cost $250,000. W. Mortensen, 209 West 76th St., New York City, Archt. and Engr.

**O., Cleveland**—M. Braduloo, 9123 Laisy Ave., (baker), awarded the contract for the construction of a 1 and 2 story, 68 x 109 ft. commercial building and bakery on East 116th St. and Buckeye Rd. Estimated cost $45,000.

**O., Cleveland**—J. O. Stein & Co., (real estate), 822 Leader-News Bldg., awarded the contract for the construction of a 2 story, 35 x 50 ft. ice cream factory, at 10521 Superior Ave. Part of building is leased to the Hoffman Ice Cream Co., 10521 Superior Ave. Estimated cost $40,000.

**O., Cleveland**—The Van Gastel Cleaning Co., 2420 Cedar Ave., plans to build a 1 and 2 story dry cleaning plant. Estimated cost $75,000. H. Van Gastel, Mgr. Architect not selected.

**O., Columbus** — The Columbus Varnish Co., 262 Cozzens St., is having sketches made for the construction of a 1 story, 100 x 300 ft. addition to its factory. Estimated cost $40,000. Jones & Abernethy, Dispatch Annex, Engrs. and Archts.

**O., Mansfield**—Dept. Public Welfare, Oak and 9th Sts., Columbus, is having plans prepared for the construction of a 2 story industrial building at the Mansfield Reformatory, here. Estimated cost $150,000. R. S. Harsh, Ohio-Hartman Bldg., Columbus, Archt.

**Pa., Brackenridge** — Atlantic Bottle Co., Brackenridge, and 90 West Bway, New York City, plans to rebuild its factory, here, which was recently destroyed by fire. Estimated cost $300,000. Architect not announced.

**Pa., Clarion**—Berney-Bond Glass Co. plans to rebuild its facory which was recently destroyed by fire. Estimated cost $400,000. Architect not announced.

**Pa., McKees Rocks**—The Chesebrough Mfg. Co., 17 State St., New York City, manufacturers of vaseline, will soon award the contract for the construction of a plant, consisting of seven buildings, including a power house, boiler house, warehouse and manufacturing buildings, here. Estimated cost $1,000,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts. Noted June 8.

**Pa., Phila.**—Harrison Brush Co., 4th and Arch Sts., awarded the contract for the construction of a 3 story, 30 x 110 ft. factory for the manufacture of brushes, at 4712-14 Market St. Estimated cost $80,000.

**Pa., Pittsburgh**—The Atlantic & Pacific Tea Co., 309 Carson St., awarded the contract for the construction of a 4 story, 75 x 120 ft. bakery on Dallas Ave. and Lynn Way.

**Pa., Warren**—C. Hamm, 28 Clark St., plans to rebuild portion of woodworking shop which was destroyed by fire. Estimated cost $30,000.

**R. I., East Providence**—Atlantic Refining Co., 715 Hospital Trust Bldg., Providence, is having plans prepared for the construction of a receiving and distributing oil plant, including 20 large storage tanks, pump houses, garages, etc., at Kettle Point off Barrington Parkway, here. Private plans.

**R. I., Manville** — The Manville Co. awarded the contract for the construction of a 1 and 2 story addition to its plant for the manufacture of cotton goods. Estimated cost $100,000.

**R. I., Pawtucket**—J. and P. Coats, Inc., 366 Pine St., will soon award the contract for the construction of 2 and 3 story, 95 x 370 ft. and 95 x 270 ft. mill buildings, for the manufacture of thread, etc. Estimated cost $375,000. Private plans.

**R. I., Wakefield**—Wakefield Textile Mills awarded the contract for the construction of a 2 story, 45 x 80 ft. addition to their woolen mill, including picker room building and dyehouse. Estimated cost $25,000.

**S. C., Greenville**—Judson Mills, Community Bldg., manufacturers of cotton goods, is having plans prepared for the construction of a 2 story, 175 x 300 ft. textile mill. Estimated cost $600,000. J. E. Sirrine Co., South Main St., Archts.

**Tenn., Kingsport**—Mead Fibre Co. plans to build a large paper mill. Estimated cost $750,000. Management Eng. & Development Co., c/o owner, Engrs.

**W. Va., Nitro**—Nitro Pencil Co. plans to rebuild its pencil factory which was destroyed by fire. Estimated cost $90,000. Architect not announced.

**W. Va., Charleston**—The Owens Bottle Co., 1401 Nicholas Bldg., Toledo, O., is having plans prepared for the construction of a 1 story, 300 x 360 ft. addition to its factory, here. Estimated cost $150,000. The Devore Co., 908 Nicholas Bldg., Toledo, O., Engrs. and Archts.

**Wis., Brillion**—Calumet Canning Co. plans to build a 2 story, 50 x 110 ft. canning factory, here. Estimated cost $45,000. J. E. De Master, 623 End Court, Sheboygan, Pres. Private plans.

**Wis., Crandon**—The Vulcan Last Co. plans to rebuild its 2 story, 60 x 120 ft. shoe factory, which was recently destroyed by fire. Architect not selected.

**Wis., Oconto**—Elsnore Veneer Co., Conneaut, O., plans to build a 1 story, 50 x 90 ft. veneer factory, here. Estimated cost $30,000. H. A. Truesdale, Local Mgr. Private plans.

**Wis., Sheboygan**—The Ke-No Mfg. Co., Pennsylvania Ave. and North Water St., awarded the contract for the construction of a 3 story, 40 x 80 ft. factory for the manufacture of novelties, on Water St. Estimated cost $30,000.

**Wis., Union Grove**—State Bd. of Control, M. J. Tappins, Secy., 902 Garfield St., Madison, will receive bids until Oct. 3, for the construction of a 1 story, 50 x 90 ft. laundry at the Wisconsin Home for Feeble Minded, here. Estimated cost $40,000. A. Peabody, Capital Bldg., Madison, Archts.